

ALGAMDI, MONA, M.F.A. Connecting Elders to Nature. A Study on Using Biophilic Design to Foster Successful Aging at Home in Saudi Arabia. (2020)
Directed by Dr. Maruja Torres-Antonini. 164 pp.

As in many cultures, elders hope to age at home in Saudi Arabia, where proximity to family and social interaction among relatives is highly prized. However, not all available housing provides optimal conditions for successful aging. This study explores whether biophilic design—buildings and spaces that allow for a human connection with nature, and which are widely credited with promoting positive physical and mental well-being—may contribute to creating empathetic, healthy, supportive, and culturally-agreeable home environments for elders in Saudi Arabia. The study is based on interviews conducted with 27 residents (50 years or older) in Jeddah, KSA, and relies on content analysis methods to identify culturally relevant biophilic design patterns that support dimensions of wellness for successful aging. The study established 11 biophilic design strategies that satisfy cultural preferences and create wellness opportunities for aging in place.

CONNECTING ELDERS TO NATURE. A STUDY ON USING BIOPHILIC DESIGN
TO FOSTER SUCCESSFUL AGING AT HOME IN SAUDI ARABIA

by

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A Thesis Submitted to
the Faculty of The Graduate School at
The University of North Carolina at Greensboro
in Partial Fulfillment
of the Requirements for the Degree
Master of Fine Arts

Greensboro
2020

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CHAPTER I

INTRODUCTION

The role played by the natural environment in the development and growth of an individual is a crucial factor that is usually unappreciated and underutilized in present societies. This role is illustrated by *biophilia*, a term that was formulated by Erich Fromm (1973) in his book, *The Anatomy of Human Destructiveness*. The concept was further popularized by Edward O. Wilson who suggested that individuals originate from nature and, therefore, have an inborn inclination toward life-like processes (Wilson & Kellert, 1995).

Biophilic design, in turn, refers to the design of spaces in a way that advances and promotes the interaction of people with nature. This entails the experience with natural things that an individual has when in a natural environment. An example is being able to witness the changes that take place during the day. Apart from being connected to the natural environment, it is important for people to be interactive with nature. As explained by Frumkin (2016), this interaction makes an individual feel part of the wider system and develop empathy for the natural system. Biophilic design applies to any type of space that promotes health by creating a human connection with nature. According to Engineer et al. (2018), biophilic design provides a long-term solution to designs that degrade the natural system.

Biophilic design appears to also have a restorative effect on humans. Studies on human-environment relationships reveal that living spaces have a significant impact on the way individuals respond to and cope with day-to-day activities (Frumkin, 2016). Presently, designers are moving towards the notion that environmental change can be a practical and more sustainable answer for some individuals' psychological, emotional, and physical problems, particularly among the elderly.

It has been noted that biophilic design can improve the quality of living of the elderly (Fields & Dabelko-Schoeny, (2015). Engineer et al. (2018) underscore that as people age, their abilities—such as sensory detection, balance, and motor skills—start to decline. Nota et al. (2017) add that research shows how being more mindful of biophilic design, hospitals and homes could have a positive impact on healing processes. This thought aligns with a study by Hidalgo (2015), which found that biophilic features provide a psychological restoration for mental fatigue among aging people. Nota et al. (2017) also underline the concept that gardens and outdoor spaces possess capabilities of shaping the behavior of individuals, which is also supported by various cultural theories.

Overall, many elderly people prefer to age at home. This is especially the case for elderly people from Saudi Arabia, where the cultural beliefs strongly encourage children to take care of their parents in old age (Gire, 2011). This brings into consideration how the positive ideas of biophilic design might be applied to the home environment of elderly Saudis, which is the core issue being addressed in this study.

Motivation

Three factors contributed to my motivation to complete this study: (a) concern for my parents, (b) Vision 2030 for the Kingdom of Saudi Arabia, and (c) my visits to Heritage Greens, a senior living community in Greensboro, North Carolina.

Parents

The first motivation for the study is my desire to provide my parents with a suitable environment that will foster successful aging at their homes. By living with them for more than 25 years, I have noticed how their physical and psychological health are significantly enhanced when they reside in their primary home, located in a village. When they stay at their house in Jeddah, their mood and health decline. The house in Jeddah is not designed to support their hobbies and desires, such as exposure to sunlight in the early morning while cultivating an outdoor garden. My awareness of the impact of aging in homes grew because of watching my parents. From there, my interest and responsiveness to this topic expanded, and I began to wonder how my parents' and the homes of my elderly relatives and acquaintances might play a role in improving their successful aging.

Vision 2030 for the Kingdom of Saudi Arabia

Over the past four years, the Kingdom of Saudi Arabia (KSA) has determined clear goals for the future of the Kingdom, seeking to provide a robust life for all Saudi citizens, nationally and globally. *Saudi Vision 2030* (n.d.) aims to build a more prosperous country for every citizen, whether senior or child, by providing advanced services in employment, housing, care, and health.

Vision 2030 for the Saudi Arabian Kingdom began by encouraging young people to identify gaps and propose solutions that would upgrade the country, providing a high-quality of life for all citizens. The aims of Vision 2030 were a strong motivational factor in conducting this research. The concept of group homes for seniors does not receive much attention in KSA because the Islamic culture requires children to take care of their parents. However, as the times change, there are now seniors who do not have children, or their children live quite a distance from them. As a result, it becomes the responsibility of the government to help these seniors and provide them with a decent life, which includes meeting their needs and offering them a good environment for aging.

The study corresponds with the Vision 2030 of KSA, which aims to provide sophisticated services to Saudi citizens. The design strategies identified by this study may contribute to how the country rethinks the design of existing elderly homes as the government begins to provide housing suitable for the elderly who have no sponsors or are low-income earners. In addition, the outcomes can help developers, as they can use the design strategies of this study to create new buildings that they can market specifically to seniors.

Heritage Greens Independent Housing for Seniors

Lastly, I was motivated by my visits to a senior living community in Greensboro, North Carolina, before I even applied to and enrolled at the university. I noted how the services available and the details of these homes helped the elderly to live independently as much as possible and for as long as possible. These homes inspired me to search for the factors that elderly people need in their environment.

CHAPTER II

LITERATURE REVIEW

Aging

Rantakokko et al. (2018) define aging as the advancement in years when people start losing strength due to weakening muscles, and they may require support from others.

Aging Stages

Growing older requires help from many people: family members, friends, medical professionals and practitioners in the community. Sometimes aging is abrupt with few or many emergencies resulting in functional decline, thus it is critical that adults recognize the stages of aging as well as seeking improved healthcare and access to services (Marak, 2016).

The first stage of aging is *self-sufficiency*. During this period, the individuals have adequate access to resources to support themselves. In terms of physical stability, they may not require much physical support when walking and may even use staircases. The next step involves *interdependence*. At this point, the elderly receives some support from family and friends while at the same time providing some self-relief. At this stage, the aging person and the other people that they depend on exist in a symbiotic relationship.

Karmanov and Hamel (2008) argue that if aging people pass through the interdependence stage, then they transition to the next step, which is the *dependence*

stage. At this stage, the individuals are not able to support themselves financially or meet other requirements in their life, implying that they must rely on family and friends to access elements such as food, clothing, and additional support.

The fourth stage is *crisis management* (Marak, 2016). The personal care for an older adult in this stage has surpassed family care, and they need formal, professional care. this kind of care can be challenging and painful for family and everyone involved and may be too costly. The end stage of aging is *end of life* (Marak, 2016). In this time, the older adult needs extensive personal help. This period is painful for family members and friends. This sort of care requires support from home health aides, nursing home personnel, hospice providers, and palliative care physicians (Marak, 2016).

Karmanov and Hamel (2008) indicate that social functioning mainly does not change much, even with aging. People still have a high need for social recognition and interaction. While people observe some minor social changes, personality traits remain largely the same. Emotional changes among aging people significantly influence their well-being. Additionally, Kandel et al. (2013) pointed out that in old age, social interactions and satisfaction may influence cognitive functioning. In other words, the support of family and friends have a positive effect on aging people to help them to reach satisfaction in their life.

Genetic Factors of Aging

Genetic factors influence the aging process. For instance, some people have specific genetically inherited health issues that affect them during old age. We must

address these factors with adequate care. According to Khraif et al. (2015), genetic factors influence the quality of life. Some people are predisposed to health challenges that are genetically influenced, which have an impact on their performance. Disease at old age may reduce the lifespan of such individuals and their quality of life during aging. Proper medical interventions and appropriate home design—in line with the daily needs of older persons—will boost their quality of life.

Health and Aging

As Karmanov and Hamel (2008) indicate that health-wise, people are adversely affected as they age. Some of the challenges that they are likely to face as they age are the loss of vision, reduction in muscle strength, and increased risk of falls (Haghnia et al., 2015). Aging may also result in reduced hearing capability and a reduction in mobility. As people age, the experiences they have differ from one person to another. There are some diseases that are likely to affect the old more than the young. For people to preserve their quality of life as they age, they should develop a living place that will enable them to mitigate these challenges and diseases. For instance, the houses they live in should provide desired warmth, reduce risks of falls, and provide ease in access to various locations within the home.

Aging in Place

Similarly, according to Janine et al (2011) the concept of *aging in place* means the functional, symbolic, and emotional attachments that related to homes, neighborhoods, and communities. Also, the term aging in place is widely used in aging policy and research.

Aging in place entails living in a house where they have access to support as they age. Such individuals would thus be able to meet their needs. The activities that the aged can carry out are those within their control and mainly those for which they had prior preparation. Those who plan for issues before they age, or move through the various stages of gaining, are more likely to retain their quality of life. And, for successful aging at home, people must properly adapt their homes and their surroundings to meet their changing needs, such as tailoring the design of their home to reduce access to heights (Thompson, 2013).

Cultural Concepts of Aging in Place

Cultural factors have an influence on the idea of aging in place. According to Karmanov and Hamel (2008), in families where people live and support each other, the aged are likely to realize the desired level of support. In contrast, in individualistic societies, where the elderly must care for themselves and are provided limited support, their well-being declines. Karmanov and Hamel (2008) say that when the elderly receive support from other family members, it influences the quality of their lives. Aging in place is affected by multiple factors, and in some cases, the aged people lack control of factors influencing their well-being at this age.

The responsibility to care for older adults varies from one culture to another. According to AlMutairi (2015), culture influences how people live at home during old age. For example, in the United States, the concept of group homes for older people is prevalent, and the act of sending an elderly family member to live in these homes is very common because it does not contradict American culture. In contrast, in KSA, where

people participate in Islamic culture, it is uncommon for adults who have children to age in group homes. Islam's rules give the elderly comprehensive rights according to their need for moral and social care and emphasizes that family must care for them as an expression of pure love. Saudi culture is based on caring for and honoring the elderly from their first frame, which is the families, to their broader framework, which is society. Society, as a whole, is required to care for the elderly if the elderly do not have family to do so. If there is not family present to provide care, then it is the duty of society and the state to provide them with decent care, including living and health needs, which assist in ensuring the dimensions of wellness for successful aging.

There are many advantages that are associated with aging in place. According to Clarak (2013), familiarity is one of the critical merits of aging in place. The seniors are familiar with the environment and acquaintances and friends of the community in which they have been living for years. Therefore, being able to remain in such locations enables them to age in a better manner. Also, Clarak (2013) asserted,

Almost 90% of people over 65 want to live in their home and community as long as possible, according to a report by the AARP Public Policy Institute and the National Conference of State Legislatures. A whopping 80% believe they will stay in their home until they die. (para. 2)

Another advantage associated with aging in place is independence. Being in their homes enables them to feel independent even if they need support from others to access their needs. Advice from Visiting Angels (n.d.), an assistance services company in the United States, suggests that for elderly adults living at home, help them to control their daily routine, activities, and decisions. This allows for people to maintain aspects of

independence with help from family, friends, or professional caregivers (“Why Seniors prefer aging in place,” n.d.).

Another advantage of living in place is saving on cost of living, which is increased when people reside at the retirement communities. Peek et al. (2014) suggest that one good way for elderly people to avoid the costly option of institutional care is to age in their homes and communities.

In addition, aging in place usually is healthier and constitutes a safer environment. Aging in home reduces the risk of illness among people, unlike in nursing homes, where the high number of residents may result in the spread of diseases to the rest of the home’s elderly and the community. Visiting Angels (n.d.) indicated, “Studies have shown that nursing home residents are at much higher risk of bacterial and viral infections, including life-threatening infections such as pneumonia” (“Why Seniors prefer aging in place,” para. 8).

Living in their homes increases the likelihood that many family members and friends can be around them, which results in enhanced well-being of individuals. Popejoy et al (2015), emphasized in their study that care coordination to older adults at their home has a positive influence on the elderly's health more than seniors who choose care coordination at a primary medical community. In other words, receiving medical care in a familiar environment has a role in achieving satisfactory health results for the elderly.

Successful Aging

The term *successful aging* refers to delaying the occurrence or reduction of the adverse effects of aging. The goal of healthy aging is to maintain the physical and mental

functions of the older person, avoid disease, and maintain independence and activity. For most people, maintaining good overall health with age requires effort. The seven following dimensions are the common standards for describing successful aging and the different qualities of aging.

Social Health

Older adults who engage in society and receive social support can improve their quality of life during the aging period. Kandel et al. (2013) emphasized that engagement is a critical element in aging. Individuals should engage in activities and affiliations that are supportive. Interpersonal relations ensure that such individuals have access to social support.

As people age, they need social support. They equally suffer a decline in energy, which might prevent them from engaging in social communication in their community or prevent them from participating in the occasions of family and friends. However, finding a supportive environment that includes suitable spaces for meeting with friends and loved ones may help support and improve social health (Stans et al., 2017). Small adjustments to the physical environment, such as lighting, humidity, temperature, setting, and furniture placement, can contribute to a communication-friendly climate and encourage conversation exchange.

Environmental Health

According to Nota et al. (2017), the destruction of the environment in which the aged live reduces their level of satisfaction with life. Appropriate environmental factors can positively influence the quality of life. Among these, biophilic design is thought to

have such effect on the quality of life of those who are aging (International Council on Active Aging, n.d.). Environmental health is achieved by “bring[ing] people into the natural environment and encourage[ing] active living through urban and property designs emphasizing walking paths, meditation and vegetable gardens, and similar options” (“What is wellness,” para. 10, n.d.). It is worth noting that as people age, they lose body stability, sensory detection, and motor skills. This implies that they must live in an environment that takes into consideration these factors. With an increase in the level of elderly people in many parts around the world, it is clear that there is a need to design suitable housing to promote well-being and fulfilment; psychological and emotional balance in the environment is an important aspect of such design. Nota et al. (2017) pointed out an emerging trend: There is an increase in building that is designed with a focus on boosting emotional, psychological, and physical needs for the aged. This means that environmental considerations are a crucial determinant to enhance the quality of life of individuals.

Emotional Health

Emotional health means being able to deal with others in a way that does not offend or hurt their feelings. It also involves the ability of a person to manage their emotions and behavior related to their senses. Such persons have excellent and constructive handling of the psychological pressures faced by the elderly in their lives. According to the International Council on Active Aging (n.d.), “Feelings are the lens through which people view the world, and the ability to be aware of and direct one’s feelings helps to create balance in life” (“What is wellness,” para. 4).

Intellectual, or Cognitive, Health

Intellectual, or cognitive, health is a state of wellness that involves realizing one's capabilities and being able to deal with the pressures of ordinary life, work productively, and contribute to society. With age, people face an increasing number of significant changes in life, which affects their mental health (e.g., career changes, retirement, and lost loved ones). Handling these changes is key to maintaining good mental health. Avoiding isolation and elderly participation in work and social activity, practicing a previous hobby, or trying a new hobby helps maintain good intellectual health. "There are many ways to stay intellectually active, including taking college courses, journaling, painting or joining a theater company, and challenging oneself with games and puzzles" (International Council on Active Aging, "What is wellness," para. 5, n.d.).

Occupational Health

Many older adults have good health, often much better than younger people. They may maintain their occupational health by participating in volunteer work or working as experienced trainers in a specific field of work. "By staying on the paid and unpaid workforce, older adults maintain or improve skills, help others, and contribute to society as experienced professionals and mentors" (International Council on Active Aging, "What is wellness," para. 7, n.d.).

Spiritual Health

Spirituality refers to feelings, thoughts, experiences, and behaviors related to the soul, or it may refer to the search for holiness. Religion and spirituality are similar concepts, but they are not identical. Many people see religion as more traditional. For the

elderly, religious society is often the largest source of social support outside the family. Religious practices increase the sense of meaning and purpose in life, which affects different healthy behaviors, and social and family relationships. “Spiritual health is living with meaning and purpose in life, guided by personal values,...group and individual faith-based activities, as well as private meditation” (International Council on Active Aging, “What is wellness,” para. 9, n.d.).

Physical Health

Physical activities for this age group include recreational, physical, or leisure activities. In a narrower sense, there is mobility (such as walking or biking), professional activities (if the person is still working), household chores, toys, sports, or planned exercises. All of these fall into the framework of activities, whether daily, family, or communal. These activities will help improve cardiovascular and muscle fitness, as well as bone health. (International Council on Active Aging, n.d.). Engaging in physical activity, choosing a healthy lifestyle, including getting adequate nutrition and sleep, managing stress, limiting alcohol intake, [and] not smoking,” help achieve physical health (International Council on Active Aging, “What is wellness,” para. 6, n.d.).

Biophilic Design

In contemporary building, there has been an increase in attempts in reconnecting human beings and the environment through biophilic design. Biophilic design is a theory positing that human beings have an innate affinity towards nature. It indicates that there is a secure connection between the health and well-being of human beings and nature. Gillis and Gatersleben (2015) explained that the concept of biophilic design is relatively

new, and the plethora of research on natural and restorative environments makes a strong case for the health and well-being potential of incorporating biophilic design attributes into the built environment. Also, according to the findings of a study carried out by Khraif et al. (2015) on the development of biophilic living environments, it is important to address the various stages involved in the aging process. Each of these stages might require different levels of enhanced biophilic design and layout of the buildings to facilitate access to services among the elderly. A study by Ryan et al (2014) established the importance of biophilic design in enhancing the aging process by improving health wellbeing and reducing stress.

Nonetheless, today much of the world's population lives in urban areas. The current conception of a city is an establishment that is completely disconnected from nature, as indicated by Ball et al. (2000). Natural environments, as well as urban settings, have become two highly separated entities, although people are highly interested in connecting with nature. According to the Administration for Community Living (2011), during holidays and weekends, many people in urban areas seek to travel to locations where they can reconnect with nature, such as parks and beaches. Even though they are typically deprived of this opportunity, it is something that significantly influences their well-being. While past research has indicated the need for children to remain connected with nature where they live, it is evident that there are limited studies that identify the benefits that the aged may realize by interacting with nature. To this end, Beatley (2011) indicates that biophilic design involves the enhancement of the various parts of the building to enhance its ability to meet the unique needs of the elderly.

Patterns of Biophilic Design

It is important to identify the design strategies that can enhance the well-being of the aged in their home. Browning et al. (2014) elaborated on the biophilia in 14 patterns divided into three main sections: (a) Nature in the Space, (b) Natural Analogues, and (c) Nature of the Space. These patterns articulate the relationships between nature, human biology, and the design of the built environment so that may experience the human benefits of biophilia in design applications. Provided here in Table 2.1 is a concise list of the three main sections and the patterns that are a part of each section.

Table 2.1

Biophilic Patterns (Browning et al., 2014)

Nature in the Space	Visual Connection with Nature
	Non-Visual Connection with Nature
	Non-Rhythmic Sensory Stimuli
	Thermal & Airflow Variability
	Presence of Water
	Dynamic and Diffuse Light
	Connection with Natural Systems
Nature of the Space	Prospect
	Refuge
	Mystery
	Risk/Peril
Natural Analog	Biomorphic Forms and Patterns
	Material Connection with Nature
	Complexity and Order

Kellert and Calabrese (2015) additionally identified biophilic design as having 24 distinct attributes of spaces capable of delivering biophilic experiences and their positive health and wellbeing effects. They grouped these attributes into three main broad categories representing the different types of experience fostered by biophilic design. Table 2.2 reflects Kellert and Calabrese's (2015) framework.

Table 2.2

Biophilic Attributes (Kellert & Calabrese, 2015)

Direct Experience of Nature	Light
	Air
	Water
	Plants
	Animals
	Weather
	Natural landscapes and ecosystems
	Fire
Indirect Experience of Nature	Images of nature
	Natural materials
	Natural colors
	Simulating natural light and air
	Naturalistic shapes and forms
	Evoking nature
	Information richness
	Age, change, and the patina of time
	Natural geometries
	Biomimicry

Experience of Space and Place	Prospect and refuge
	Organized complexity
	Integration of parts to wholes
	Transitional spaces
	Mobility and wayfinding
	Cultural and ecological attachment to place

Nature in the Space

In biophilic design terms, the nature in space refers to interventions that are aimed at forging a direct physical and temporary presence of the place. One of the essential elements of nature in space is the visual connection with nature. Some of the strategies employed to realize these goals are potted plants, flower beds, courtyard gardens, green walls, and roofing. The well-being of the aged is highly influenced by what they see from their surroundings.

While plants were traditionally used for medicinal and nutritional purposes, having plants indoors has the potential of enhancing the flow of air within the home settings. One of the critical considerations that should be made when it comes to maintaining plants indoors is the level of lighting. Adequate lighting indoors facilitates the growth of plants; it is also necessary for boosting one's reconnection with the natural environment.

Other positive attributes of houses for older adults include access to proper ventilation and sunlight, ensuring that there are adequate lighting and air circulation in the house. Thermal controls guarantee that the home is maintained at the right temperature. According to Bird and Wildlife Watching (2011), natural ventilation may

also result in the increased flow of air into the building, improving aeration and access to clean air among the elderly residing in such houses. Cooling systems are also crucial in the designing of homes that are meant for the elderly. Thus, on hot days the elderly will have access to a comfortable environment.

Biophilic design improvements incorporate touch, sound, smell, sight, and taste, which are vital senses among human beings. There are several examples related to the incorporation of these senses in the biophilic design. For example, haptic sense, gardening, and horticulture activities help to enhance the physical health of adults and reduce the pain among senior populations with arthritis (Browning et al., 2014). Also, exposure to small herbs like mint have positive impact to enhance mood and relaxations because the olfactory system is related directly to the brain (Browning et al., 2014). In addition, The International Well Building Institute (2011) indicates that the existence of trees around the building may attract the nesting of birds in such regions. Birds chirping provide sounds that allow the elderly to reconnect with the environment in which they live, enhancing the health and well-being of older adults.

Another sensory element that is explored in the development of biophilic design is smell. When pleasant smelling flowers are established in the houses of the elderly, they provide an opportunity to relax and enhance their welfare. Such scents may assist in the reduction of stress among such individuals (Hawsawi, 2016). According to Bovill and Bovill (1996), sight is considered in the development of the biophilic design. For instance, the development of aquariums in houses enables the elderly to reconnect with

nature. Other visual elements that are utilized in biophilic design include the proper use of paintings and shade, something that enhances the mood of the aged.

Nature of the Space

“Nature of the space patterns look at the design of the built world around us and, more importantly, how we relate to it” (Nora Systems, “Nature of the space,” para. 1, n.d.). This pattern could be implemented in three ways. The first one is *prospect*, or an unimpeded view over a distance for surveillance and planning. The second one, *refuge*, is a place for withdrawal or areas for protection from environmental conditions. The third one is *mystery*, the promise of more information achieved through partially obscured views (Browning et al., 2014). One example of this mystery pattern is using the mashrabiya design in the windows of the building. The Mashrabiya element is

A structure that wraps around windows or balconies on...the higher floors...overlooking the outside of the house.... the structure of the screen is literally an assemblage of small pieces of turneries dovetailed one into the other, without the use of glue or nails in order to enhance the climate temperature and keep the privacy of women in their homes. (Mohamed, 2015, p. 6)

Using this biophilic pattern corresponds to various climate conditions. For instance, it may create design areas for improved indoors thermal flow for reducing stress levels. Ideas include Mashrabiya design in windows or other interior designs that increase indoor ventilation to connect people with the broader environment in which they live and, at the same time, protect them from the thermal outside. Browning et al. (2014) explain "Orienting building, fenestration, corridors, and workstations will help optimize visual access to indoor or outdoor vistas" (p. 45). This may be attained in elderly homes by

including extra elements such as balconies or large windows that have a kind of special glass, which gives the person a full view of the surroundings while protecting them from high temperatures.

Natural Analogs

Natural analogs include biomorphic forms and patterns, material connection with nature, and complexity and order (Browning et al., 2014). There is a significant relationship between nature and design. The nature in space and the natural analogs provide a framework for understanding the numerical arrangements of nature.

Natural shapes give designers inspiration for the thoughtful incorporation of a variety of strategies in building construction. People with low memory require a living environment that is easy to handle. Routine connections with nature through biomorphic forms could enable people to live well and enhance memory and mental functions: "Use biomorphic forms and patterns in a way that creates a more visually preferred environment that enhances cognitive performance while helping reduce stress" (Browning et al., 2014, p. 38).

Natural materials also have a positive effect on enhancing health. Browning et al. (2014) share how researchers observed that a room with a moderate ratio of wood (i.e., 45% coverage) has a role in the significant decrease in blood pressure and significant increases in pulse rate. Also, Browning et al. (2014) emphasize that the color green, which is evocative of vegetation, has a positive effect on mental functions and creative activities (p. 40).

Saudi Culture

Since the Islamic religion is considered the basic constitution in Saudi Arabia, it plays a big role in the culture and behavior of Saudi citizens, including even the building of homes. According to Eldardiry and Elmoghazy (2018), Saudi Arabian culture is influenced by the Islamic practices, the role of history, and Bedouin traditions, which make it different from western cultures. It is not only Islamic religion that has impacted art and architecture in Saudi Arabia, additionally the history of the country and Bedouin traditions is remarkably widespread throughout many regions in Saudi Arabia. This makes the culture of Saudi Arabia unique; distinct from other cultures and western countries since it is interrelated and intertwined by the laws of Islamic religion.

Islam is a comprehensive religion for Muslims, including every moment and every aspect of daily living. It is also a set of beliefs, values, and behaviors that people deeply embrace to guide their decisions in all aspects of social, economic, political, and cultural interactions. The original sources of religion for all doctrines, purposes, and judgments come from two revelations: the Qur'an and the Sunnah. Qur'an is the words of God, and Sunnah are word and activities of prophet Mohammad.

The word of Islam means to surrender and submit to God, Allah. Muslims do not need other religions nor any prophet other than their Prophet Muhammad, and believe that all things they own, even their very lives, belong to God alone. Yusof (2011) states that Islam means submission of the whole self to God. This submission means that performance of devotional works should be entirely to God.

قال تعالى: "الْيَوْمَ أَكْمَلْتُ لَكُمْ دِينَكُمْ وَأَتَمَمْتُ عَلَيْكُمْ نِعْمَتِي وَرَضِيتُ لَكُمُ الْإِسْلَامَ دِينًا" سورة المائدة

Today, I have perfected your religion for you, and completed My favor upon you, and have granted Islam as a religion for you – a commitment to live in peace. (Quran: Surat Al Maidah, 3)

This verse of Allah's from the Qur'an emphasizes to Muslims that the religion of Islam is completely complementary to all aspects of life. The Qur'an is very clear on what is forbidden and permissible in everyday life and all affairs. All instructions from the Qur'an or Sunnah must be obeyed by Muslims.

Followers of Islam should conform fully to Islamic law and teachings. Given that the entire lives of Muslims are subservient to the will of Allah, Muslim societies can never break from the law of God (Yusof, 2011). The political order, social organization, culture, economic policy, and legal systems of Islamic societies must align with the code of guidance revealed by Allah in His Book (Qur'an) and the traditions of the prophet (Sunnah).

قال تعالى: وَمَا كَانَ لِمُؤْمِنٍ وَلَا لِمُؤْمِنَةٍ إِذَا قَضَى اللَّهُ وَرَسُولُهُ أَمْرًا أَنْ يَكُونَ لَهُمُ الْخِيَرَةُ مِنْ أَمْرِهِمْ ۗ وَمَنْ يَعْصِ اللَّهَ وَرَسُولَهُ فَقَدْ ضَلَّ ضَلَالًا مُبِينًا" سورة الاحزاب

It is not for any believer, man or woman, to have the choice in the affair when a matter is decreed by Allah and his Prophet. Whosoever disobeys Allah and His Messenger strays into clear error. (Quran: Surat Al-Ahzab, 36)

This verse from the Qur'an captures words from Allah that shows how the Islamic religion is included in all aspects of Muslim life and doctrine, both legal and practical.

Islamic Art

Islamic art includes visual arts created as far back as the seventh century, and Islamic art is not limited to religious confinement such as Buddhist art (Raza-Ul-Haq, 2013). Muslims and non-Muslims alike have embraced this art, since they lived in territories that were culturally and politically Islamic. Flood and Necipoğlu (2017) acknowledged that it is challenging to define Islamic art because of its age and because it covers extensive populations and lands. Yusof (2011) claimed that Islamic art is not restricted to religion, place, or time. Even without clear boundaries, Islamic art ranges from painting, ceramics, calligraphy, architecture, glass, and textiles. Islamic art, such as carpets, Girih tiles (i.e., tiles containing geometric patterns), and woodworks are demonstrations of motifs and styles within Islamic art. They show outstanding religious inscriptions.

Islamic art has distinctive and vibrant art forms, and it includes different cultures incorporating regional aesthetics that exhibit influences from various traditions (Osier, 2018). Art is used to mirror worldviews and culture. As it is, Islamic art reflects cultural values revealing an Islamic point of view about the universe and spiritual realm. (Yusof, 2011) explained that Islamic artists are not attempting to replicate nature, but instead they try to show what nature represents. It is within the Islamic culture to embrace beauty since it is considered a divine quality. Prophet Muhammad's hadith said that "Allah is beautiful and loves beauty."

Ornament

Islamic artists have created decorative patterns using different techniques such as unity, repetition, networks, rotational and formal design, and reflective symmetry and abstraction. Over the years, Islamic art has developed more unique characteristics that were distinct from the early artistic traditions. Islamic designers have been endlessly stimulated by the natural world to explore different design possibilities within nature. Over time, the element of Islamic art became popular and reproduced by non-Islamic artists. For example, the famous British artist William Morris was inspired by Ardabil Carpet, a famous Islamic piece of textile art (Osier, 2018).

Vegetal Ornament. Vegetal Ornament is known as the art of secularization, where there are forms of flowers and plants (Jiwani, 2011). Vegetal patterns "consist of the stylized forms of many leaves and plants especially the vine leaves as they continue to grow and shows the concept of infinity" (Jiwani, 2011, p. 20). This type of ornament depends on the transfer and change of nature, that is, stripping it of its natural characteristics while retaining its full essential qualities. The Islamic "ornamental elements are based on the principles of infinity, abstraction, symmetry and repetition, arabesque and bordering. These principles established a unity of ornamenting in every area of decoration in Islamic art" (Shafiq, 2014, p. 20).

Plant ornament varies to include many types such as symmetry, which is either pivotal, wholly, or half, as well as repetition, which depends on the redrawing of the decorative elements several times with the use of each of these elements several times. Various floral drawings and roses of different forms are included in the plant motifs.

Vegetal ornaments appear in various forms of Islamic art depicting natural flowers that are highly stylish and complex (Cuddon, 2013).

Geometric Ornament. The geometric pattern is a complex ornament. It uses several overlapping and interlocking geometric shapes together, Based on their complexity and design, the geometric patterns may vary (Jiwani, 2011). The most important of the geometric patterns are the polygonal star shapes, geometric designs such as triangles, squares, pentagonal shapes, circles, and lines. These are the basis for the construction of geometric decoration.

Islamic geometric patterns are formed from four basic shapes: circles, squares, stars, and multi-sided polygons. The circle and the square are the most basic shapes. The star shape is derived from squares or triangles inscribed in a circle, and the 8-point star is a common element in Islamic art. (Juliao, "Islamic geometric patterns," para. 2, n.d.)

Plant motifs and geometric motifs are used in Saudi homes in a remarkable way, such as the use of geometric motifs in the windows as an aesthetic view and to maintain the privacy of the home. It is also expansively used in geometric decoration in ceramics to beautify floors. The distinctive architectural style of some neighborhoods in Saudi Arabia is a great historical value, which carries unique types of architecture and ornamental Islamic art, such as some buildings in the city of Taif. Also, Balad, a neighborhood in Jeddah, has great types of Islamic ornamentation.

Calligraphy

Calligraphy is a highly creative Islamic art form that dates back 1,400 years; the principle of it is a transmission of text but in a decorative manner. The art form of

calligraphy usually represents featured lines from the Qur'an or poetry and is used as an element of decoration in art and architecture. Obtaining knowledge by writing and reading has high value in Islam. According to Radio Islam International (n.d.) "The first Surah revealed to the prophet Muhammad SAW begins with the word 'IQRA', read!" (para. 2). This reinforces the importance of calligraphic words and their artistic and religious significance (Rabbat, 2011). This explains why Muslim artists are interested in creating independent art related to writing. Osier (2018) indicates that calligraphy is the quintessential Islamic art since its subject matter is the Holy Qur'an. In addition, the prohibition of collages in Islam may be the reason for the creation of calligraphy ornament in the Islamic world. Flood and Necipoğlu (2017) add that calligraphy became prominent in Islamic art because portraying people and animals is forbidden for religious purposes. The words of the Qur'an, both in meaning and visual representation, have become a focus of artistic expression, thus making calligraphy a vital aspect of Islamic art (Flood & Necipoğlu, 2017).

Kufic, Naskhi, or Naskh script are the most popular types of calligraphy ornament. Kufic is a calligraphy style that was established in the late seventh century and took after the name 'Kufa' from Southern Iraq. The Kufic pattern used in different manuscripts of the Qur'an, architectural inscriptions, and ceramic decorations. On the other hand, Naskhi was easier to read. "Naskh scripts are the second most popular after Kufic because of its characteristics. The script was named Naskh or 'copy' because most calligraphers used Naskh script to copy the Quran" (figure 2.6; Changezi, 2017, p. 2). Today, calligraphy is used in lots of life themes. Calligraphy appears in architecture,

paper, ceramics, carpets, glass, jewelry, woodcarving, and metalwork (Ekhtiar & Moore, 2012).

Islamic Architecture

The architecture in Islamic societies and countries is based on Islamic principles and the culture within the country (Othman et al., 2015). The guidelines for principles of Islamic architecture are privacy and hospitality, but these principles are influenced by unique cultural factors that operate within their countries of residence.

Architecture entails designing a building with the help of science and art to reshape the natural environment to be suitable for humans' needs and comfort (Yusof, 2011). Specific to Islamic architecture, Flood and Necipoğlu (2017) emphasize that there is a focus on concepts of harmony, balance, and unity, since these are Islamic ethical pillars. In other words, Islamic architecture in all Islamic countries has four overarching principles: (a) human interaction, (b) culture, (c) hospitality, and (d) privacy.

Characteristics of Islamic Saudi Architecture

The Kingdom of Saudi Arabia (KSA) has developed its unique architectural heritage over centuries. Verifiably, building structures and materials in Saudi Arabia were initially dictated by the atmosphere, topography, and accessible resources (The Embassy of The Kingdom of Saudi Arabia, "Culture and arts," n.d.). In western Saudi Arabia, stone and red bricks were normal, while Jeddah's manufacturers utilized coral from the Red Sea (The Embassy of The Kingdom of Saudi Arabia, n.d.). Though these materials were used out of necessity in previous ages, contemporary Saudi engineers are progressively looking to these customary structure plans and Islamic ideas for inspiration.

This mix of the conventional with the modern reinforces the connection between a beloved past and a creative future.

Privacy. Although traditional housing and architecture have evolved in values, design ideas, technology, and the use of appropriate building materials in accordance with the climatic and cultural conditions in each region of Saudi Arabia, a universal characteristic for all the regions is that of privacy. For example, the housing style in the western region of Saudi Arabia includes height and multiple floors, where frequently, the exterior openings are covered with mashrabiya (see Figure 2.1).

The mashrabiya element is

A structure that wraps around windows or balconies on the...higher floors overlooking the outside...of the house.... The structure of the screen is literally an assemblage of small pieces of turneries dovetailed one into the other, without the use of glue or nails in order to enhance the climate temperature and maintain the privacy of women in their homes. (Mohamed, 2015, p. 6)

In contrast, the housing style in the center of the country includes one or two floors with a courtyard that has a few small openings, and the interior walls of the house are looking over the yard to ensure the maximum privacy at home by society (Bahammam, 1998, p. 558). Although both regions have different architectural characteristics, they have a priority for privacy by using mashrabiya and small windows that look to the yard. Privacy is the main factor that shapes how Muslim home dwellers plan, build, perceive, and use their interior home spaces (Omer, 2015).

Figure 2.1

Mashrabiya Covering of Exterior Windows (ABIYA | Mashrabiya, Fretwork, Jali and Decorative Screens, n.d.)



Privacy is a phenomenon associated with humans and their ways of life. Living, and related customs and traditions have had a clear impact on Islamic architecture. The privacy in Saudi Arabian architecture focuses on two main types: (a) visual privacy and (b) audio privacy.

Visual Privacy. To protect the privacy of families and women in their homes, visual privacy is of high importance in Islamic design. The architecture provides this visual privacy by creating a design that provides interior privacy in certain culture residences. “Windows, doors, opening and the opening treatments toward privacy should be taken into considerations in designing Muslim dwelling in future” (Razali & Talib, 2013, p. 413).

Audio Privacy. Audio privacy does not mean complete isolation from the surrounding environment. The goal is the protection and purification of the undesirable sounds, while allowing the transmission of sound from the outside to the inside enough to communicate with the external environment surrounding the dwelling. Audio privacy is not only about keeping certain sounds from entering the dwelling. At the same time, the goal is to give the human complete freedom to express their emotions and different sensations without any of that being heard from outside the dwelling.

Razali and Talib (2013) said that the layout plan and house design should follow the Islamic principles of visual and audio privacy. Saudi architectural work is mandated to have sound isolation in the external walls. Additionally, the Ministry of Municipal and Rural Development Affairs in Saudi Arabia mandates the installation of thermal insulation systems in all new constructions that coming up in the Kingdom (Mohammed, 2014). The building isolation works to protect the indoor environment and maintain the privacy as well as enhance the indoor climate (Brebbia, 2012). Insulation materials are regularly used in contemporary buildings in Saudi Arabia, and there are various choices of insulation materials depending on where the materials are utilized in the home. Almehrej (2015) explains that the blocks in interior walls are less thick than external walls, where the external walls contain compressed polystyrene as thermal insulation. Additionally, there is an audio insulation function. "The window frames are in aluminum, glazed with frosted glass that prevents any views in or out" (Almehrej, 2015, p. 180).

Layout. All in all, Islamic architecture in KSA must provide different spaces that meet the different needs and requirements of living freely and with great flexibility. This

includes providing insulation, whether visual or acoustic, to assist the home dwellers in meeting the requirements of their daily lives and preventing inappropriate social and psychological conditions. In other words, the desired outcome is complete freedom without intruding on others' personal freedom. This is expressed in the layout of the entrance, the separation of spaces by gender, and the provision of privacy.

Entrance. When starting to construct a residential building in a country such as Saudi Arabia, the architect must accurately consider the privacy of the house (e.g., windows, entrances, and doors). Figures 2.2. and 2.3 portray the interior design of the Saudi house. Homes or apartments usually have two or more entrances. The first entrance is for the family members and close relatives, while the other one is for the male guests. This second entrance for male guests is intended to preserve the privacy of the home by preventing visual intrusion into the house. Figure 2.2 shows a typical residential floor with four apartments in Saudi Arabia, which have entrance doors that do not face neighbors' doors or main streets, and each apartment has two entrances. Traditional Muslim homes place entrance doors facing away from neighbors and main streets (Lasker, 2016). This can be seen in the layouts of Figures 2.2 and 2.3. The primary components of privacy incorporate oneself, family, and society. Privacy could be considered a major influence on the connection among individuals and society and among open and private spaces.

Figure 2.2

Topical Residential Apartments Second Floor (Mona, 2017)

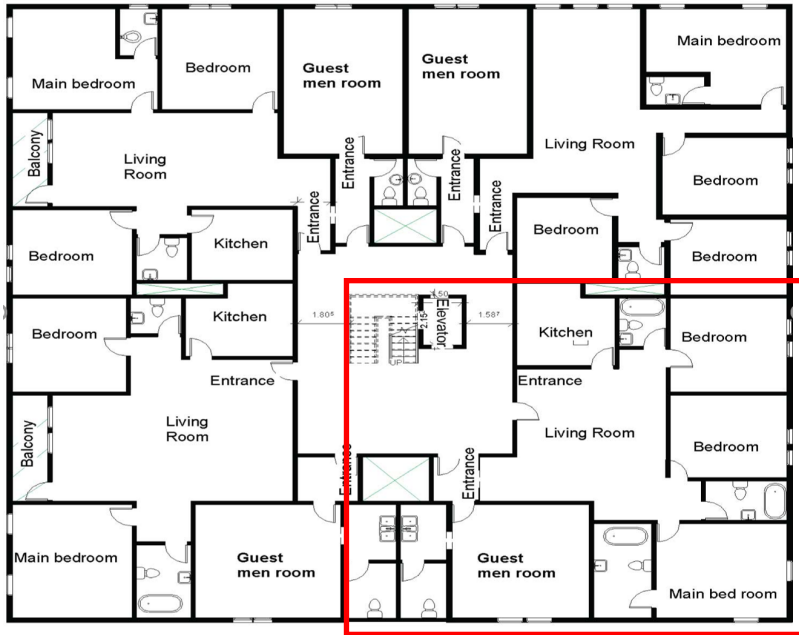
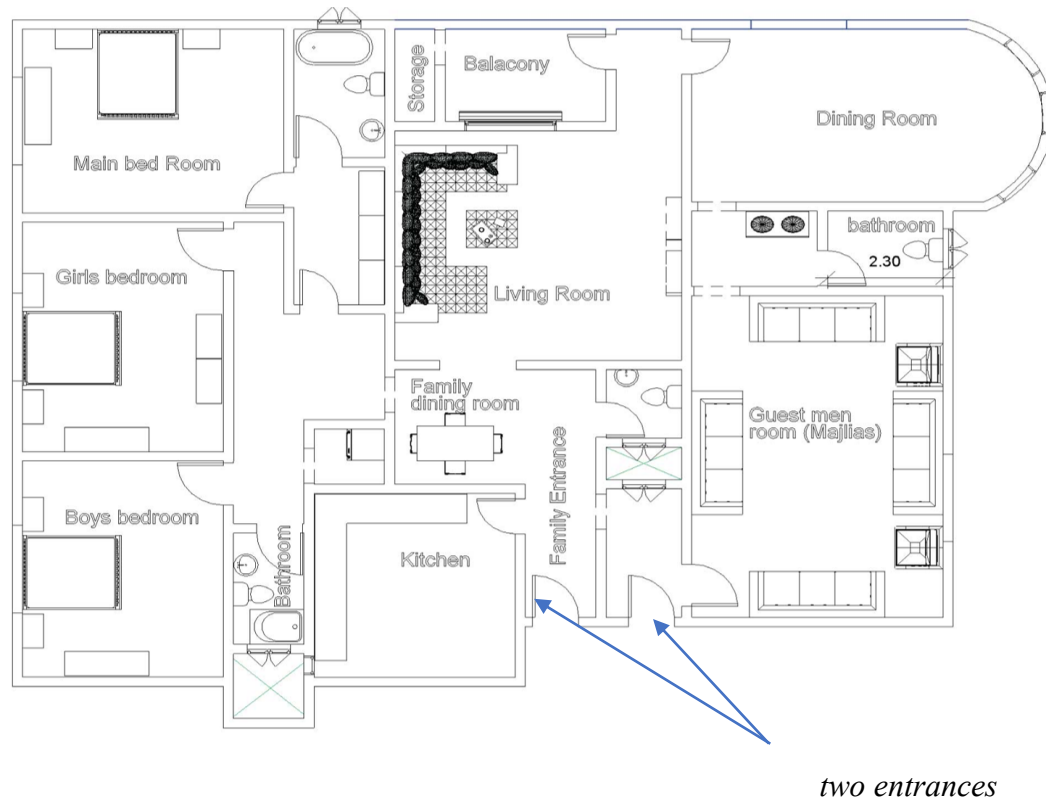


Figure 2.3

Two Entrances



Gender Separation. The Qur'an refers to hospitality in the following words:

Has the story reached you, of the honored guests (Jibril and two other angels) of Abraham? When they came to him and said: "Salaam, (peace be upon you)!" He answered: "Salaam, (peace be upon you)," and said: "You are a people unknown to me." Then he turned to his household and brought out a roasted calf. And placed it before them, (saying): "Will you not eat?" (Surah Adh-Dhariyat 51:24-27)

The Prophet (peace be upon him) also reinforced the Divine command by reminding Muslims to be hospitable. He said, "He, who believes in God and the Last Day, let him show hospitality to his guest" (Siddiqui, 2016). What follows, due to these

texts, is the Islamic tradition of hospitality. Hospitality is a common practice in the Islamic culture. The host puts effort into making sure that the guests are comfortable while visiting (Sobh & Belk, 2011). Saudi-Islamic homes have a specially designed guest room, or Majlas, for this purpose (Kaya, 2017).

Figures 2.2 and 2.3 indicate the priority of the hospitality section in the home space and the separation among male guests and female guests. According to Almehrej (2015), “The importance of providing especially spaces only for guests in Saudi's home is unusual in worldwide housing design that such provision should be so influential” (p. 183).

Furthermore, the Majlis is an important area for receiving and entertaining guests. Houses may feature a guest section usually having two rooms: the Majlis and the Magalat, or dining room. The Magalat is the link between the family areas and the male guest section. The design of this room follows a U shape, is completely covered in carpet, and accommodates seating on the floor (see Figure 2.4). It can be arranged using several mattresses around the perimeter of the room directly on the floor or raised on a frame (Kaya, 2017). The male guests' room (Majlis) is located close to the main entrance. This arrangement preserves the privacy of the home and keeps the Majlis completely separated from the enclosed spaces, which are reserved for the women (Kaya, 2017).

Figure 2.4

Magalat (Mona, 2019)



Summary and Chapter Conclusion

The study indicates that as people age, their physical and cognitive capabilities decline. Also, the literature review indicates the extent to which biophilic design may be a suitable environment for the elderly and may help in promoting the dimensions of successful aging in place. Still, the issue is that many architects do not care about this. It is thus important to carry out more in-depth understanding when it comes to the aspect of aging in place and put a criterion of biophilic design in correspondence with spatial and climate conditions.

It is essential to design an environment in a manner that compensates the elderly's loss. Gardens and other features in the outdoor environment enhance the well-being of individuals. Vegetation releases oxygen to the atmosphere guaranteeing such people have

access to clean air. The building's interior should also be of the right temperature, and the floors should be of the right texture to avoid falls among older ones, who are prone to such falls.

All aspects of Muslim life, including the social, political, and economic aspects, are guided by the Koran and the Muslim traditions. The Muslims are of the view that all that they have emanates from resources Quran and Sunah. Islamic art is part of the cultural heritage that the Muslims exhibit. Islamic art is drawn from extensive regions where Islam was practiced from the 7th century. Islamic art includes the decorating ornaments and textile arts. Islamic art is also evident in the way buildings are established in the country. The layout has geometric formations that are used in indicating space allocations in the house and the purpose of the house in KSA. These include requirements for the number and placement of entrances, the separation of genders, and the provision of privacy.

The previous literature review provides relevant information for exploring the possible intersections between the concept of successful aging, biophilic design, and the cultural patterns of Islamic Saudi residential design.

CHAPTER III

METHODOLOGY

Introduction

As explored in Chapter II, several studies indicate that biophilic design patterns are conducive to achieving successful aging. While the previous literature indicates that architecture based upon biophilic design provides a suitable living environment and allows the older adult to easily interact with nature, it also suggests the importance to carry out in-depth real-life studies with seniors to show that biophilic design has a role in fostering successful aging (Sutton & Austin, 2015).

The study reported within this thesis manuscript brings into convergence three domains—Biophilic Design, Dimensions of Successful Aging, and Saudi Residential—which were surveyed in the literature presented in Chapter II and expressed in Figure 3.1. This inquiry sits at the convergence of these three domains.

The study adopts an intersubjective philosophy and relies on qualitative research techniques—semi-structured interviews and on-site observations—to determine if and how biophilic design, along with culture-specific design, create a suitable environment for the elderly and aid in successful aging at home. Specifically, as discussed in Chapters I and II, this study aimed to answer the research question: *Which are the biophilic design strategies that may support successful aging at the home environment in Saudi Arabia?*

Figure 3.1

Biophilic Design Strategies for Successful Aging at Home in Saudi Arabia (Mona, 2020)



Study Objectives

The following research objectives were formulated at the onset of the study to inform the research question and define a framework for the study. The first objective was to identify the dimensions of wellness for successful aging. This objective contributed to figuring out people's needs in their homes as they get older, which are (a) emotional health, (b) occupational health, (c) social health, (d) physical health, (e) environmental health, and (f) spiritual health. Providing aging needs and optimal home environment characteristics may assist effectively in successful aging. The second objective was to identify the biophilic design strategies, which include 14 patterns, some of which may promote successful aging in the home environment in Saudi Arabia. The third objective was to understand the influence of Islamic culture, in KSA, on the

construction of the homes in Saudi Arabia, where its impacts on home design is significant. These objectives directed the literature reviewed for the study and was presented in Chapter II.

Research Philosophy

This study is based on an intersubjective philosophy, which indicates that the world is understood by human beings intersubjectively, based on their sociocultural perspectives. Intersubjectivity is described as “the ability to share conscious experiences and empathetic communication” (Pam, 2013, para. 2). It is also defined by Hall (2014) as “the coordination of individual contributions during a discussion” and represents “the knowledge construction achieved through a synergistic progression from individual contributions to sequences of interdependent contributions within the discourse” (p. 1). Hall explains that those contributions might be either verbal or written and are offered from those engaged in the discussion.

Further, according to the intersubjective perspective, the meaning assigned to people’s behaviors is consistent with their culture, which means that as a research philosophy, it gives credit to how the subject perceives the issue, not just how the researcher perceives it, on the basis that an issue is objective when diverse subjects (people) agree on its meaning. However, while there are many differences in sociocultural perspectives, it is possible to attain a common one (Bertrand & Hughes, 2018). Despite different perspectives, the reality is that all of humanity tend to follow the same behaviors (Hall, 2014).

Study Design

Sources cite the 1981 definition of *study design* by Selltiz, Wrightsman, and Cook as the “arrangement of conditions for analysis and collection of data in a manner that aims to combine relevance to the research purpose with economy of procedure” (as cited in Jankowicz, 2005, p. 190). To answer the research question in a way that is relevant to the research as well as efficient, the study was designed as an exploratory study relying on qualitative data collection methods—semi-structured interviews and on-site observations—and analysis of data through content analysis followed by triangulation of results and interpretation to arrive at the study findings.

Research Approach

Qualitative research methods involve the use of qualitative data, such as interview documents and observation, in order to understand and explain a social phenomenon. (Peshkin,1993). According to Sutton and Austin (2015), a qualitative study can help researchers assess the feelings and emotions of the research participants. It can be used to determine how many people undertake behaviors; qualitative methods can help researchers to understand how and why such behaviors take place.

Researchers realize various advantages from the use of the qualitative methods approach. It facilitates the collection of empirical data and allows for its in-depth analysis. The researcher can gain new information that was not sought under the research questions, but which is still relevant to the study (Bertrand & Hughes, 2018). Such information provides a different dimension and understanding of the phenomenon under review.

Data Collection Methods

Sampling

Sampling included a representative pool of Saudi nationals. The subject profile desired for this study was seniors over 50 years who are residents of Saudi Arabia and of Muslim faith, and who do not have cognitive or other impairment that would impact their ability to reason or judge. This resulted in a convenience sample from Jeddah, KSA, which facilitated identifying people who were within reach by the researcher.

The key goal of the convenience sampling method is to reduce the number of subjects under study to complete the study on time while at the same time making the study representative of the entire population. In qualitative research, a small sample is adequate as it will facilitate deep analysis of the phenomena under study. "Convenience sampling is a specific type of non-probability sampling method that relies on data collection from population members who are conveniently available to participate in the study" (Research Methodology, "Convenience sampling," para. 1, n.d.).

Recruitment

Subjects were recruited by first asking elderly people who were acquaintances and friends of the researcher. Recruitment expanded by asking for recommendations from those initial elderly people for additional participants. The final research study sample comprised 27 respondents, 15 women and 12 men, with ages ranging between 60–80 years. None of the seniors selected in this study suffer from a disability that would impair their reasoning or judgment. This sample size was adequate for meeting the study aims, given its exploratory nature. In general, small samples, such as the one used in this

research, are considered adequate for qualitative research, as they facilitate in-depth analysis of the issue.

Questionnaire Development and Pilot Study

A questionnaire was developed to guide the intended interviews and ensure the collection of relevant data. Questions were informed from the literature review, particularly from Kellert's Patterns of Biophilic Design (Browning et al., 2014) and from the International Council on Active Aging's Seven Dimensions of Wellness (n.d). Additional questions on traditional Islamic design were extracted from the literature reported in Chapter II.

The questionnaire originally consisted 30 questions distributed along three sections, each with its own focus and purposes. Part A, Background, consisted of demographic questions providing contextual information for the study. These questions aimed to confirm if the respondents met the criteria for the study, including their current living conditions, as well as to collect additional information about their current living conditions for contextualizing the analysis of the data. Part B questions centered on biophilic design patterns, and in Part C, on home design features related to their culture.

Pilot Study

Before conducting the interviews in Saudi Arabia, the proposed interview questions were tested in a pilot study. For the pilot study, the researcher interviewed five individuals living in Greensboro who met the study subject profile: they were all over the age of 50; all of them were from Arabic, Muslim countries— two from Sudan, one from

Syria, and two from Saudi Arabia; all of them self-identified as being cognitively able to make a decision; and all accepted to be interviewed in their homes.

Many merits are realized from the use of a pilot study. For instance, it allows for a proper assessment of the facts relating to the study. There is a risk that incorrect information may mislead the researcher (Bertrand & Hughes, 2018), so conducting a pilot study provides feedback for revising any weak points before conducting the final research. Conducting a pilot study saves time and money in the long run because it provides enough data to enable the researcher to decide whether to continue with the main study or not. Another benefit is that a researcher may try several measures to determine the one that may produce the best results in the final study. Finally, conducting a pilot study provides the researcher with ideas and approaches that might not have been noted before carrying out the pilot study. The discovered ideas and approaches increase the chances of attaining clear findings of the final study. A pilot study thus makes the outcome of the study more objective (Bertrand & Hughes, 2018).

Some points were noticed as an outcome of the pilot study: the difficulty in assessing a sample study among women when they do not disclose their real age; second, the difficulty in finding enough elderly people representative of the target population (i.e., from countries that have a similar economy to Saudi Arabia, such as Kuwait, United Arab Emirates, and Oman). These two were limitations of the pilot study. Third, the researcher tried using a heat map method, but noticed it did not assist well to obtain the desired research outcomes. A heat-map is

A visualization of the areas of influence of each point and further summation places where areas overlap. The color gradient represents the power of influence at a certain point. For the anon-cartographer users, the map is attractive, easily readable and the visualization is more comprehensible. (Nétek et al., 2018, p. 368)

Nonetheless, the researcher noticed that this method did not assist well to obtain the desired research outcomes. In addition, a heat map study is not effective with a small dataset; “the heatmap is a visualization technique that is particularly well suited to visualizing large datasets” (Barter & Yu, 2018). Thus, this method was dispensed from the interview.

Other outcomes of the pilot study helped revise the interview approach and questions. Mostly, many of the interview questions resulted in one-word answers (i.e., Yes, No). These outcomes prompted the following study changes: Regarding the interview questionnaire, there were changes to question wording to prompt the participants to talk more about their feelings and their difficulties. Second, the pilot study suggested that when conducting interviews in Saudi Arabia, the researcher should walk with participants in their homes during the interview to help them remember any desires or difficulties they face in their homes, confirming that taking them through their homes would be helpful for encouraging subjects to speak about their space design elements.

Interviews and Observations

Ethical considerations had to be made in this study, which involves human subjects. Therefore, the study was carried out after approval from the Institutional Review Board from the University of North Carolina at Greensboro, as well as from the Directorate of Health Affairs in Saudi Arabia – Jeddah. All participants were asked to

sign a consent paper, which was provided to the participants before conducting any research. All participants were able to give consent to participate in the study by signing on the consent form before answering interview questions. Study documentation (e.g., consent forms, interview information) were stored in a locked file cabinet at the researcher's home to keep participants' information safe and for ensuring that the study was based on facts. Additionally, to preserve their identities, participants selected a pseudonym for identification in the study itself.

Interviews

The researcher contacted subjects to set appointments for home visits with face-to-face interviews. The interviews were carried out in Jeddah, KSA, in the first half of the month of August. The researcher met with each participant once for about two hours of interviews conducted during visits to participants' homes. All research components related to participants, including recruitment, consent, interviews, and follow-up, were conducted in the participants' primary language, Arabic.

This study used semi-structured interviews to collect data. Barriball and While (1994) describe semi-structured interviews as useful in collecting data accurately when trying to obtain complex and deep information of a phenomenon. In a semi-structured interview, the interviewer does not strictly follow a formal list of questions; more open-ended questions are asked in such interviews. While the researcher may have a list of interview questions, they may not ask all of them, only focusing on the most applicable questions. The interview method requires that the interviewer can establish a relationship with the interviewee. This creates room for future contacts and further data collection

from the same respondent, implying that the researcher can always gather the right data.

Interviews further facilitate the collection of primary data.

In this study, three groups of questions were asked in the interviews, which corresponded to the three parts of the questionnaire. The study posed preference questions to the subjects to answer the following:

1. Which biophilic design strategies support successful aging in the home environment?
2. Which are the culturally appropriate strategies for aging in a home in Saudi Arabia?

Included in the interview were observations of the extent to which the participant's answer matched the current environment of the elderly, and to assess whether the answers corresponded with the researcher's observations. The researcher also made observations during the home visits to note the compatibility of the participants' responses with their current living environment. If subjects consented, the observations also included taking photographs of some areas in the home, such as pictures of the men's guests' room or *Majlis*, and pictures of the outdoor garden and the wall of the yard.

Advantages of Interviews in Data Collection. This study significantly benefited from the advantages associated with the use of interviews for data collection. Interviews help the researcher to access accurate and detailed information (Animating Democracy, n.d.). Additionally, face-to-face interviews have the distinct advantage of enabling the researcher to establish rapport with participants and therefore gain their cooperation. They also allow the researcher to clarify ambiguous answers and seek follow-up

information (Fielding et al., 2017). As expected, the interviews helped access the appropriate information and the researcher was ready to clarify to the respondents any misunderstandings.

This method can be advantageous when researchers have a comprehensive list of interview questions because it helps target the specific phenomenon or experience that the researcher is investigating. It makes interviewing expedient and helps in gathering the correct information that the researcher needs, so there should not be much-needed follow-up interviews for missed or forgotten questions. This makes for easier access to the data (Bertrand & Hughes, 2018). Using the interview to collect data helps probing and asking follow-up questions to reveal deeper information, which is also useful when the sample has limited reading or writing skills (University of Wisconsin Eau Claire, n.d.). And, unlike secondary data, the primary data are usually original and not altered by other people. As a result, such data are reliable, and the inferences made from interview data are accurate (Fielding et al., 2017).

Data Analysis

Subject responses collected during the interviews—transcribed and translated into English—became the first-source data informing this study. Data from the interviews is considered very important in answering the research questions; getting answers from real-life experiences significantly helps to confirm or deny the validity of the research (Valenzuela & Shrivastava, n.d.). This data was the subject to a basic content analysis as described in Chapter 3, with the purpose of identifying emerging categories from coded

answers and assess their recurrence or frequency, taken as indicator of their relative importance for the subject or preference.

Coding

Data encoding helps to control the communication and communication process with regard to the encoded data, thus access to the obvious outcomes. In qualitative research, a code is “most often a word or short phrase that symbolically assigns a summative, salient, essence-capturing, and/or evocative attribute for a portion of language-based or visual data. The data can consist of interview transcripts, participant observation field notes” (Saldaña, 2008, p. 3).

In this study, subject responses were examined to identify occurrences or units of analysis. The study took occurrences to be the individual instances when a word or phrase appeared within a subject’s response which could be recognized as a specific idea or concept providing an answer to the question. Occurrences were coded to reflect the different themes that surfaced from the content. From this, the researcher identified 74 total themes that translated into 74 codes: 20 codes for the answers that related to the demographic questions, 37 codes for the answers that related to questions about biophilic design patterns, and 17 codes related to questions about culturally appropriate design.

Recurrence and Emerging Categories

In a typical content analysis, emerging categories is the stage of data analysis when the researcher begins noting the number of occurrences of participants’ answers and links them with the subjects of the study. The second stage of data analysis helps the

researcher develop the concepts into categories and looks for possible relationships among the categories (Bloomberg & Volpe, 2012).

A frequency count was performed on the coded themes, noting the number of occurrences in each one, and captured in process tables. This allowed identifying the most reoccurring (frequent) themes which were seen as preferred (the most important, dominant, or desirable). The process assisted in making a preliminary distinction of whether the most significant themes corresponded to any of the three dimensions of study.

Triangulation of Results

In this third stage of data analysis, the researcher looped back to the theory to reflect on the results from phases 1 and 2, rechecking the data against the theory, and following Bloomberg & Volpe (2012), developing propositions that interrelated and described the interrelationships among categories. Therefore, in the third stage, the researcher traced the overlapping of the recurrent themes. The tabulation of this data included the categories that corresponded to one or more of the dimensions of wellness in aging (comprised of seven dimensions of successful aging) and 14 patterns biophilic design, adding the criterion that these overlapping categories aligned with or at least did not contradict Arabic residential design (i.e., cultural) features. The final step was the creation of a third table of findings, which includes design strategies that correspond to biophilic design, support successful aging, and align with the culture of Saudi Arabia.

Limitations of Study

There are some limitations to this study. Some of these limitations are inherent to the interview method. First, the interview method for collecting data did not allow the researcher to collect large amounts of samples, and the use of open-end questions yielded data collected that is difficult to analyses. The interviews took a long time as a result of the open-ended questions, as well as the participant's often going off-topic in their answers. Another limitation was the contradictions between the participants' answers and the researcher's observations, possibly reflecting participant or observer bias, though the researcher thought that these discrepancies resulted from the desire of the subjects to present their home as a perfect. Therefore, facts not matching observations were not used in the second phase of the analysis. A final limitation stemmed from the need to translate the research documents—questionnaires and instructions—into Arabic, and then translate the participant responses into English. Knowing that additional bias may have been introduced through their translation, an expert translator reviewed the conversions between Arabic and English languages.

Chapter Summary

This study is based on intersubjective philosophy that supports exploratory research. The study relied on qualitative methods for data collection and analysis. Interviews and observations were the main methods used for data collection, and they facilitated an in-depth understanding of the phenomenon under inquiry, which are the biophilic design strategies that may support successful aging at the home environment in Saudi Arabia.

Interviews were based on a questionnaire developed by the researcher and tested through a pilot study. The study was based on facts provided by the respondents, which could be observed and verified. This was important in the provision of the solutions to the questions under study.

The researcher recruited for the study by reaching out to previously known elderly people, 50–80 old years, who were acquaintances and their friends. The study's data collection consisted of in-home visits that involved open-ended interviews and observations the current environment of the home. The sample of the study was 27 older adults. All seniors selected in this study were of Saudi nationality, and they did not suffer from a disability, so they were able to provide consent to participate. The researcher worked on content analysis of the study that through a number of stages. The subject responses were coded to reflect the different themes that surfaced. The most frequent themes were identified based on occurrences mentioned. Then, there was a preliminary assessment of whether and how these themes corresponded to dimensions of successful aging, to biophilic design strategies, or whether they aligned with a culturally sensitive design for Saudi cultural patterns. The end-stage of data analysis was triangulation, which traced the overlapping of the recurrent themes and identifies the design strategies that correspond to Biophilic design, support successful aging, and align with the culture of Saudi Arabia. The study was carried out in an ethical way, the rights of all respondents were observed, and the researcher remained objective in the data collection and analysis processes.

CHAPTER IV

FINDINGS

This chapter presents analysis results from the interviews conducted with the study subjects—27 elderly adults who live in their own homes in Saudi Arabia—and the triangulation of these results that led to study findings.

Questionnaire Results

The interviews collected data about the subjects' preferences and aspirations for the homes in which they were currently aging in place, as well as their views on biophilic design strategies that might be incorporated there. It focused on semi-structured interviews that were conducted in the homes of the participants. Each interview asked the 26 questions developed in the questionnaire. The questions were designed to elicit opinions from the participants on a range of issues related to their current home environment characteristics and their biophilic and culture-related design preferences.

In this chapter, each question is followed by a brief summary of results, illustrated by a table. For the B and C interview sections, tables additionally show a preliminary assessment of the relationship between coded subject answers and patterns of biophilic design. Data from these interviews were later cross-referenced to identify which might be successful residential design practices that support elders aging in their homes in Saudi Arabia.

Part A: Background

Questions Q1 through Q6 verified the subjects' qualifications for participating in the study; confidentiality codes replaced the subjects' names in Q1. Results describe the sample as being residents of Jeddah, KSA, and between 50 and 80 years old, with 55% (n = 15) of participants being over 60 years old, and 62% (n = 17) of participants were female. Over 40% (n = 11) of the respondents live in a single-family house, with only 2 out of the 27 respondents (7%) requiring home environment accommodations at the time of the interview. These results are illustrated in the Figures 4.1 through 4.5.

Figure 4.1

Participants' Gender Distribution

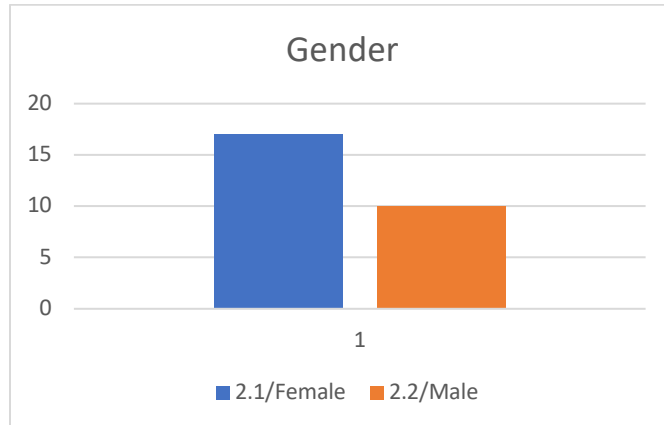


Figure 4.2

Participants' Age Distribution

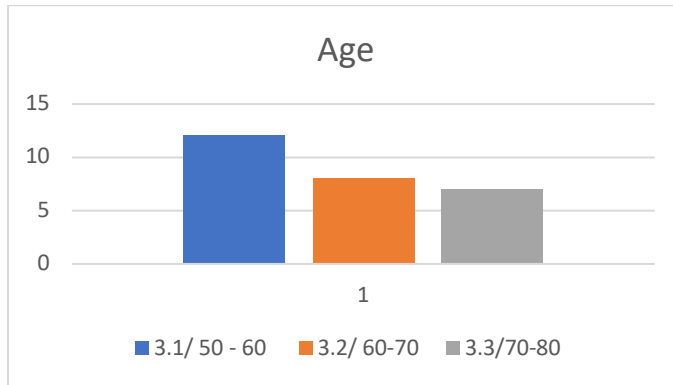


Figure 4.3

Subjects' Residence Type Distribution

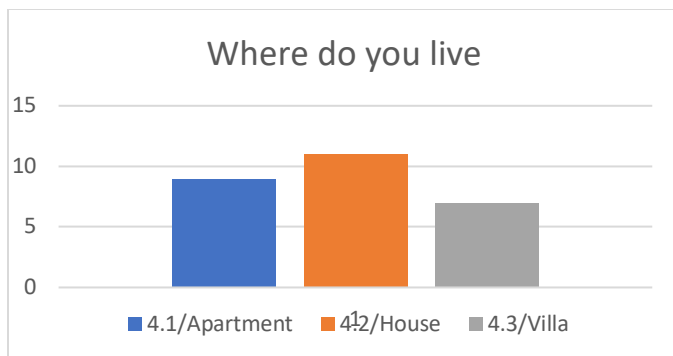


Figure 4.4

Subjects' Health Limitations Requiring Home Environment Accommodations

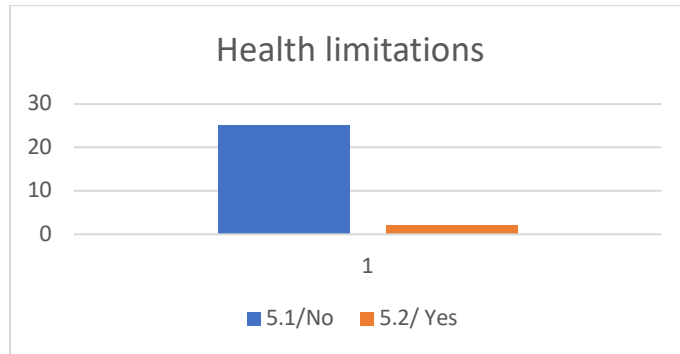
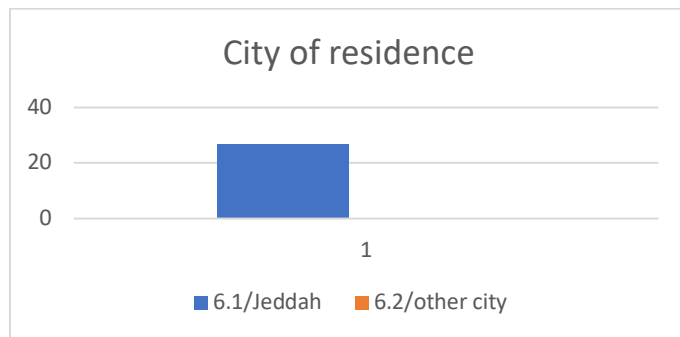


Figure 4.5

Subjects' City of Residence



Questions Q7 through Q10 elicited further information on the subjects' home environments, their preferences, and habits, to provide further background for interpreting the study results. Figures 4.6–4.9 illustrate the coded categories that emerged for each question and the recurrence of the subjects' responses.

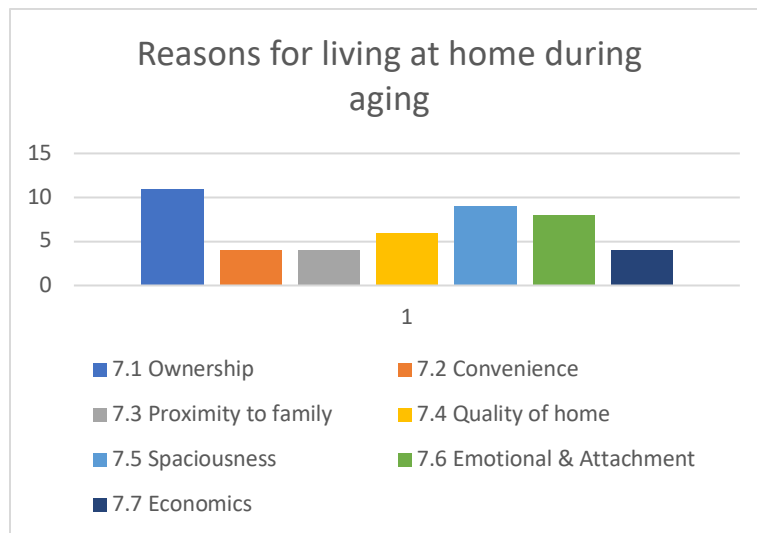
Q7. List Reasons for Living in Your Home at this Time (One or More)

The single most often response provided by participants was homeownership (n = 11 of N = 49 occurrences). Participants also responded with answers that were

categorized as emotional health (n = 8 occurrences). However, largely the answers emphasized the importance of environmental health (n = 22 occurrences), expressed as being able to be independent (n = 3) in their own homes, the convenience of its location in relation to other amenities, and the general quality of the home (n = 13). Economic reasons (n = 4) were expressed as cost of housing (e.g., “priced rental cheaper”).

Figure 4.6

Subjects’ Reasons for Staying at Home While Aging



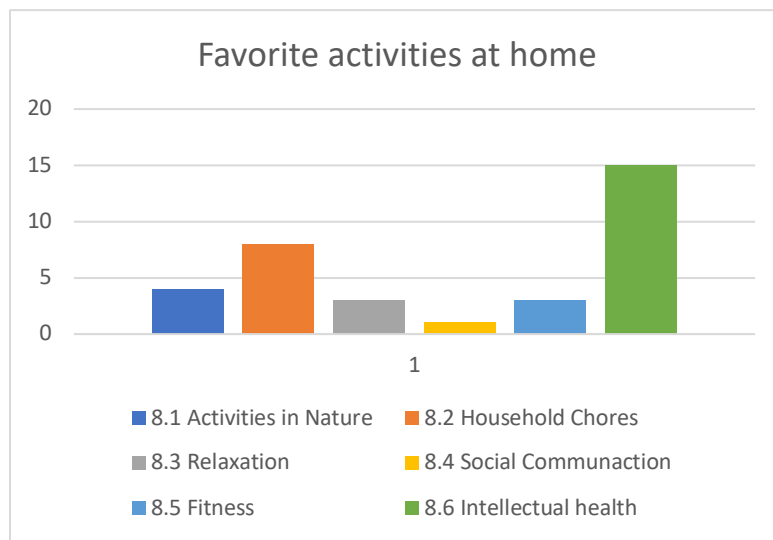
Q8. Can You Describe Some Activities that You Like to do in Your Home?

As seen in Figure 4.7, of the 27 responses provided by participants, five (of N = 34 occurrences) related to the intellectual health dimension of successful aging. These included activities such as reading Qur’an, listening to lectures, playing puzzles, and watching TV. The second most frequent answers were related to daily household activities (n = 8). Also, the bar chart illustrates some nature-related activities such as

gardening and caring for yard plants (n = 8), which correspond to the physical health dimension.

Figure 4.7

Home Activities Preferences

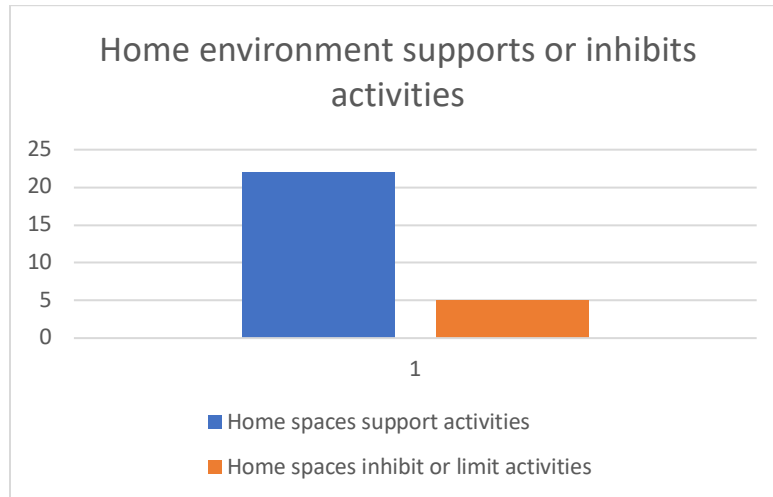


Q9. How does Your Home Environment Support or Inhibit These Activities?

As shown in Figure 4.8, participants mostly found their homes suitable to their daily activities (n = 22 of N = 27 occurrences). Even as participants remarked about unsuitable spaces five times during the interviews, this suggests a strong tendency among interview participants to be satisfied with the support provided by their current home environments.

Figure 4.8

Satisfaction with the Support Provided by the Current Home Environment

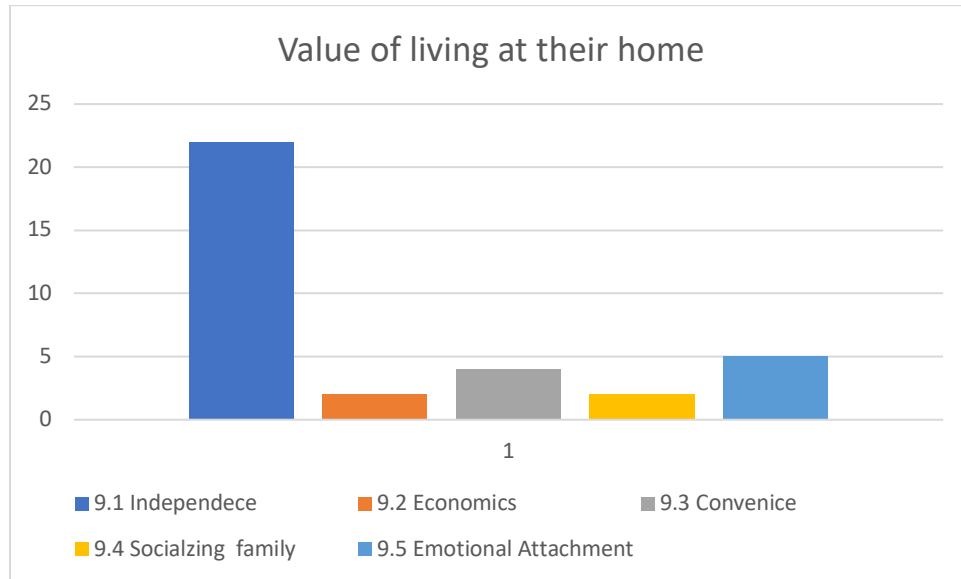


Q10. What do You Appreciate/Value About Living at Home?

As seen in Figure 4.9, in question 10 of the interview, participants most often associated the value of their home with emotional health and independence, with such expressions as “I feel free in my home,” “no one control[s] me,” “I do anything I want,” “my mom was living here” ($n = 27$ occurrences from $N = 35$). In contrast, the answers that related to the social health and financial health dimensions of successful aging were the least frequent responses ($n = 2$).

Figure 4.9

Subjects' Perceived Value of Their Current Home Environment



Part B: Biophilic Design

In this section of the interview questionnaire, subjects were asked about their preferences for a set of biophilic design strategies that could potentially be applied in their home designs. These strategies were comprised of: (a) use of natural colors and natural and local materials as indoor finishes, (b) connection to and engagement with nature or natural areas, (c) use of nature-related motifs and ornamentation (animal or vegetal), (d) use of natural aromas and sounds, (e) use of natural lighting and ventilation, (f) exposure to sunlight, and (g) direct interaction with household pets.

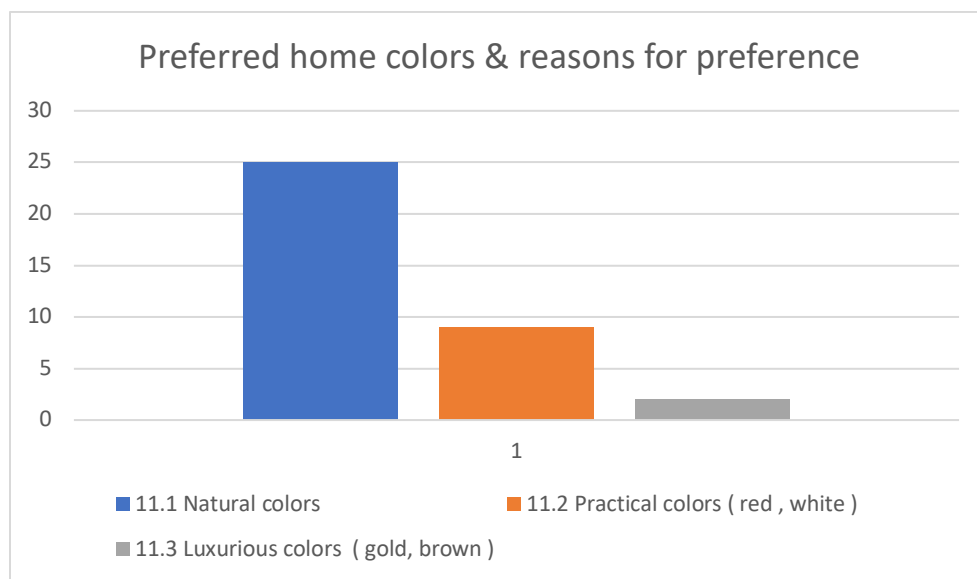
Answers to questions Q11 to Q21 follow. They are illustrated by corresponding Figures 4.10–4.20, showing the resulting coded categories and their respective recurrences.

Q11. Which Colors do You Like to Use in Your Home, and Why?

As seen in Figure 4.10, for Q11 the most recurrent answer ($n = 25$ occurrences from $N = 36$) favored the use of light colors (blue, white, green, yellows and gray), which corresponds to a naturalistic color palette. When prompted for a reason for their preferences, $n = 17$ answers from these 25 mentioned that such colors led to relaxation and comfort. Other answers ($n = 8$) from this group did not provide a reason for their preference. The second most frequent answer for color preference ($n = 9$ occurrences of $N = 36$) was “practical colors,” claiming this choice for practical reasons. This possibly relates to the need of elderly people to be able to take care of their home easily; “practical colors” would require less cleaning or less effort to clean.

Figure 4.10

Color Preferences for the Home Interior

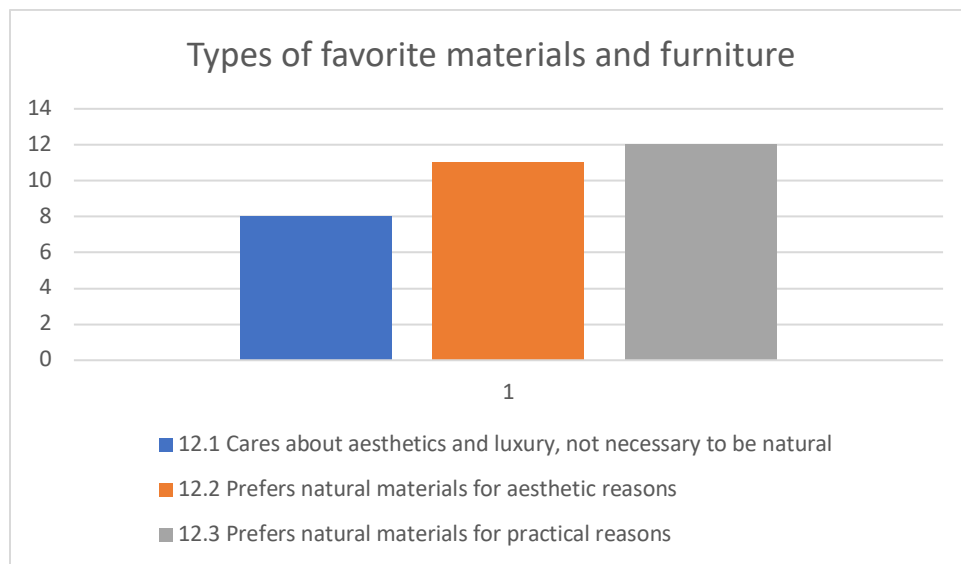


Q12. Which Materials do You Prefer to Use for Furnishings and/or on the Interior Surfaces of Your House?

The bar graph in Figure 4.11 shows $n = 23$ occurrences (from $N = 31$) favoring the use of natural materials in the house, which establishes a connection to nature. Browning et al. (2014) describe them as “material and elements from nature that, through minimal processing, reflect the local ecology or geology to create a distinct sense of place.” They can “feel rich, warm and authentic, and sometimes stimulating to the touch” (p. 40). The reasons behind this tendency toward natural materials was split between two reasons: aesthetics ($n = 10$) and practicality ($n = 13$). Only eight responses of the 31 occurrences (26%) indicated not caring about the use of natural materials.

Figure 4.11

Preferred Materials for Interior Finishes, Furniture, and Furnishings

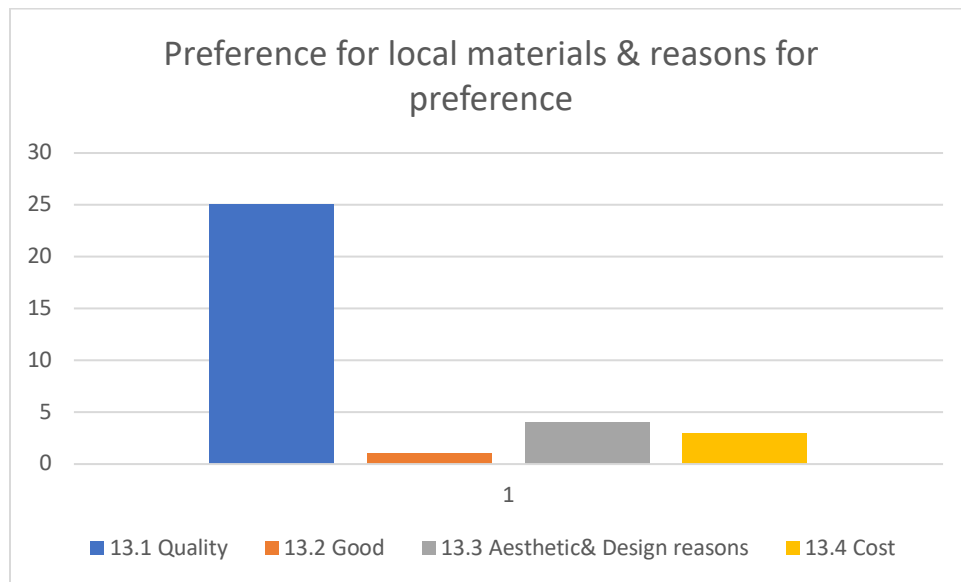


Q13. What do You Think About Using Local or Saudi Finish Materials and Products?

The bar graph in Figure 4.12 shows $n = 32$ of $N = 33$ occurrences from the subjects arguing that they do not care about the source of the materials used in their homes. The most frequently cited reasons ($n = 25$) were concerns about the quality of the materials; others' opinions ($n = 4$) were split among the aesthetics and the design of the materials. Only one occurrence indicated preference for local materials.

Figure 4.12

Preference for the Use of Local or Saudi Materials in the Home Environment



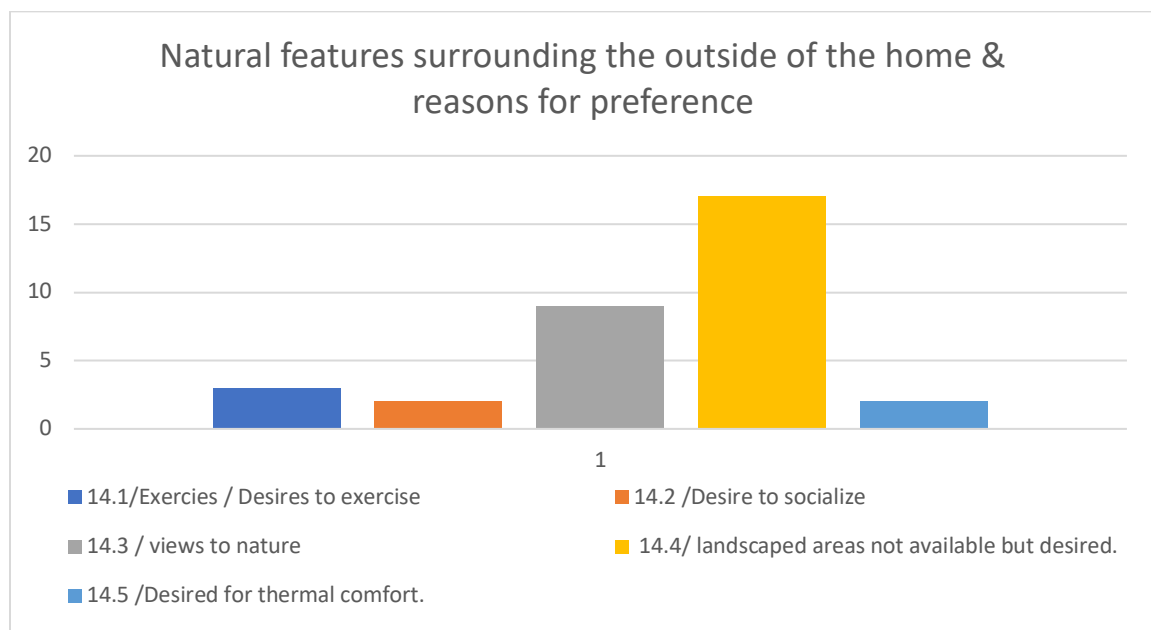
Q14. What Natural Features Surround the Outside of Your Home, if Any?

As seen in Figure 4.13, in the interview, the most recurrent answer ($n = 17$ of $N = 33$ occurrences) was not having access to natural features, such as landscaping, at or near the home. This was confirmed through observation. However, some subjects at least had views of nature from their homes as indicated by $n = 9$ occurrences confirming the

presence of natural features surrounding their homes. Some participants referred to “colorful flowers” or “there are some shrubs around my home.” On the other hand, some responses indicated their desire to have natural landscaping, especially public green areas, to help them socialize with others (n = 2) and to exercise (n = 3).

Figure 4.13

Availability of Natural Areas or Landscapes Around the Residence



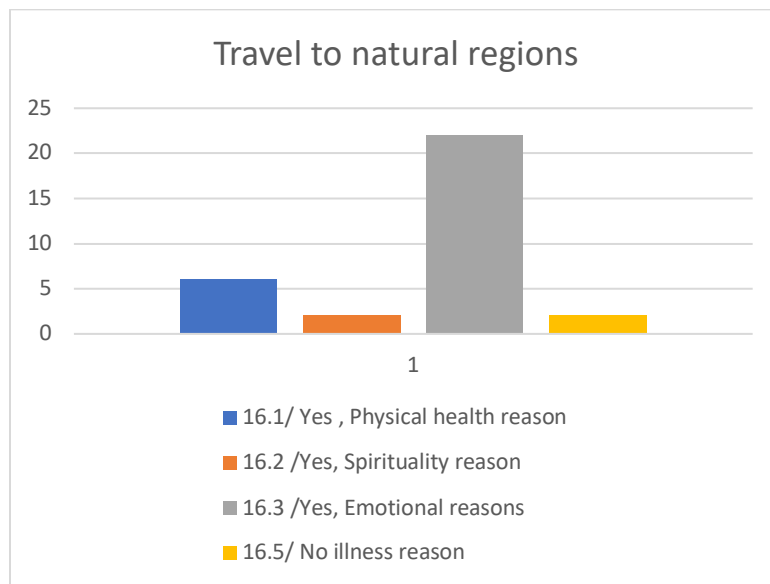
Q15. Do You Like to Visit Natural Areas? Why?

The bar graph in Figure 4.14 demonstrates that almost all the participants desired to be close to natural environments for various reasons. The highest occurrences favoring a naturalistic region were related to preferences based on emotional reasons (n = 22 of N = 32 occurrences). They offered statements for the preference such as “The sound of water enhances my mood,” and “Nature improves my mood.” Other recurring statements

(n = 6) alluded to physical health, such as nature “encourages me to walk.” An additional two of N = 32 occurrences stated that being close to nature enhanced their spiritual health. However, just two participant answers said not liking to travel because of suffering from a physical disease.

Figure 4.14

Preference for Visiting Natural Areas

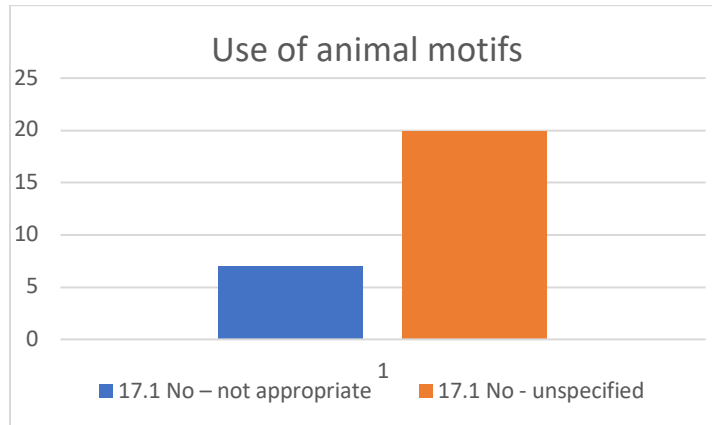


Q16. What is Your Opinion About the Use of Animal Motifs at Home?

From Figure 4.15 it is clear that all subjects (100%) reject the use of animal motifs at home, which n = 20 of N = 27 occurrences attributed to religious reasons and associated their preferences to concerns about the health of the interior home environment.

Figure 4.15

Preference for the Use of Animal Motifs in the Home Environment

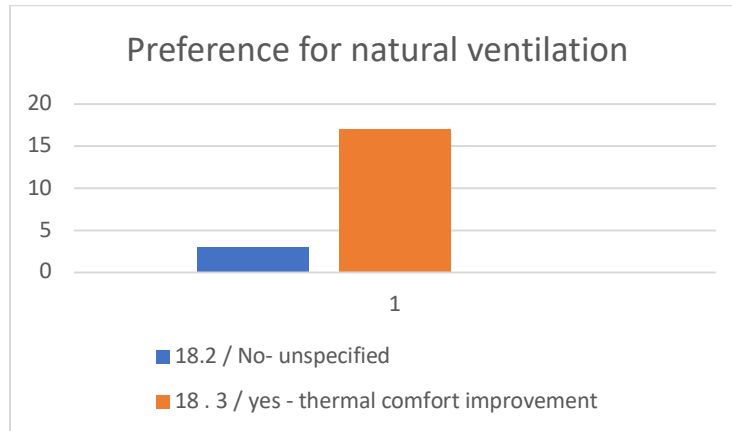


Q17. What do You Think of Having Natural Ventilation, Shading Devices, Exposed Walls, or Other Means of Feeling the Natural Changes in Air Temperature and Humidity from the Environment?

Shown in Figure 4.16, $n = 21$ of $N = 24$ occurrences in answers to Q17 indicated liking the use of natural ventilation, with $n = 17$ of those connecting this preference to improvement of the interior home climate. Meanwhile other subject statements rejected these design elements or strategies because of concerns that their use might cause an increase in interior temperature ($n = 3$).

Figure 4.16

Preference for Natural Ventilation in the Home Environment



Q18. How do You Feel About Using Natural Ambient Aromas at Home?

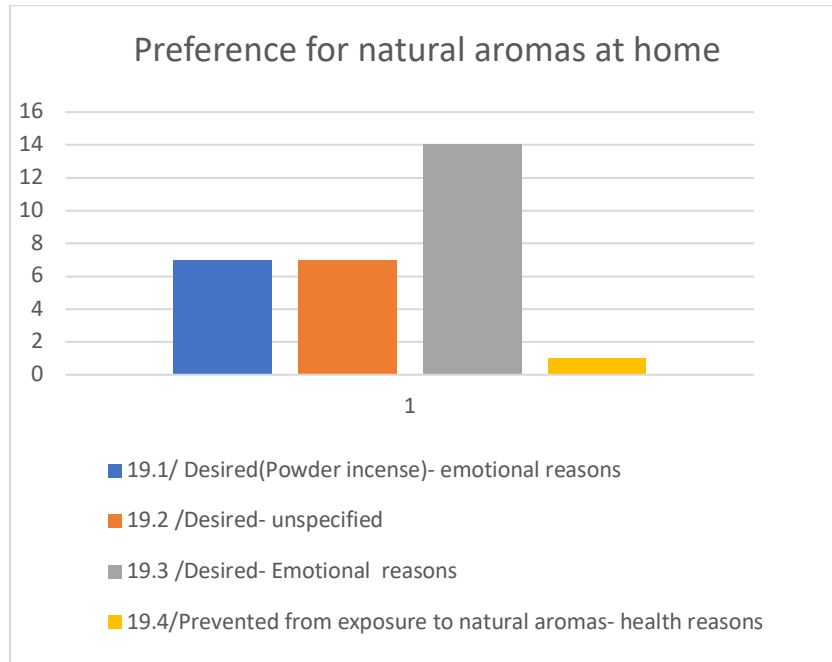
This question aligns with patterns of biophilic design for non-visual connections to nature, explained as “the auditory, haptic, olfactory, or gustatory stimuli that engender a deliberate and positive reference to nature, living systems or natural processes.”

(Browning et al., 2014).

The bar graph in Figure 4.17 shows clearly that almost all the occurrences ($n = 28$ of $N = 29$) allude to preferences for aromatic scents, although for different reasons. Some of the participants specifically mentioned powder incense ($n = 7$), which is a type of natural air freshener commonly used in Saudi Arabia. Others ($n = 14$) preferred other natural aromas. All $n = 21$ occurrences of preference for natural aromas referred to their emotional effects. For example, subjects said, “Natural aromas make me happy,” and “I feel close to nature.”

Figure 4.17

Preference for Natural Aromas in the Home Environment

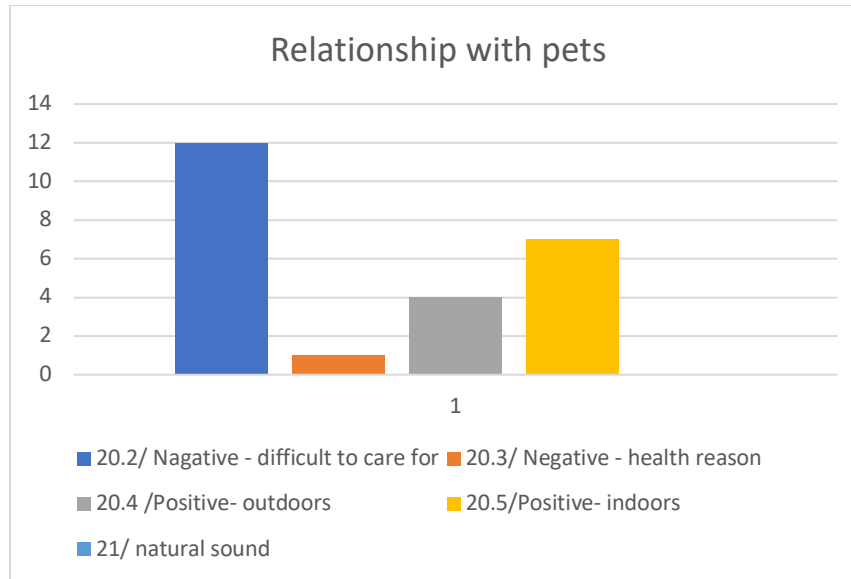


Q19. What do You Think About Having Animals Within Your Compound or in Your Home Environment?

As seen in Figure 4.18, $n = 12$ of $N = 28$ responses stated not liking pets—which are culturally seen as unclean—in their clean home. Still, $n = 7$ of these occurrences mentioned keeping small animals, such as fish or birds, indoors because they would enhance the participants’ emotional health at home. Some comments offered were “I love a canary at home, it is enjoyable at home,” and “They contribute to an enjoyable and fun time at home among family members.” Four occurrences were expressions of allowing to keep larger animals in the residence so long as the animal is outdoors.

Figure 4.18

Preference for Having Household Pets

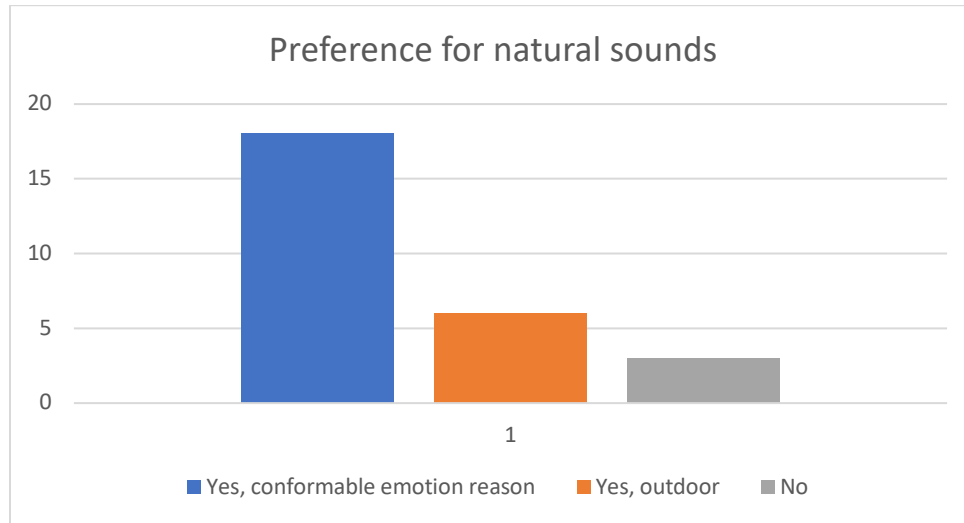


Q20. Do You Like Hearing Natural Sounds in Your Home, Such as the Sound of Water (Fountains), the Sounds of Birds, or the Sounds of Wind and Foliage?

Figure 4.19 presents that the highest number of occurrences in the subject responses said they liked hearing natural sounds at home ($n = 27$ of $N = 27$ occurrences). When prompted for a reason as to why they preferred natural sounds indoors, the answers converged toward helping attain positive emotions ($n = 18$). On the other hand, there were participants who preferred natural sounds, though only for the outdoors ($n = 6$ occurrences), and others who did not appreciate natural sounds, whether indoors or outdoors ($n = 3$ of 27 occurrences).

Figure 4.19

Preference for Natural Sounds in the Home Environment

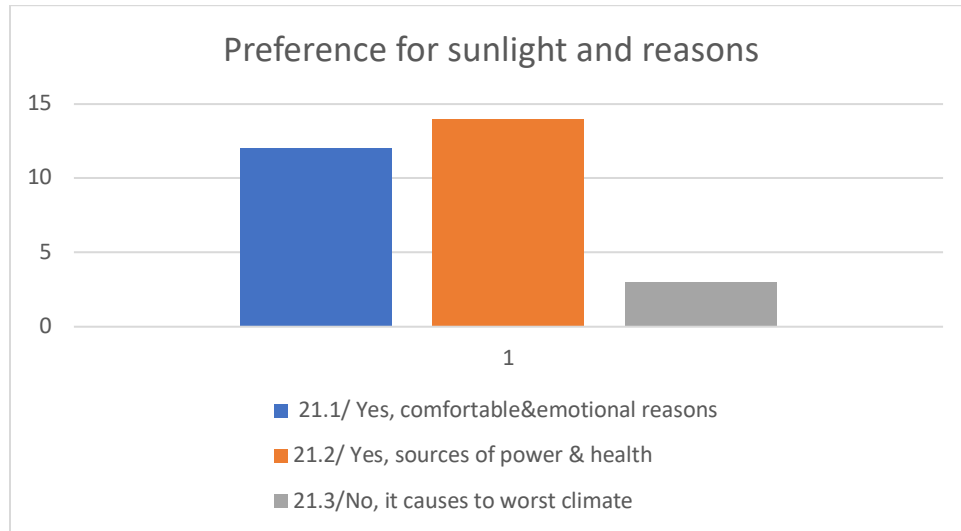


Q21. Do You Like to Have Sunlight Enter Your Home Through Big Windows or a Balcony? Why?

Interviews collected $n = 26$ of $N = 29$ occurrences where participants indicated liking access to sunlight. As seen in Figure 4.20, $n = 14$ of those 26 were manifestations of liking sun because it is a source of power and health; others ($n = 12$ of $N = 26$) referred to liking the sunlight for emotional and comfort reasons. On the other hand, ($n = 3$ of the $N = 29$ total occurrences) were about rejecting sunlight access into the home fearing it might cause an increase in interior temperature.

Figure 4.20

Preference for Sunlight and Reasons for this Preference



Part C: Saudi Culture Design

In this final section of the interview questionnaire, subjects answered questions Q22 through Q27, which explored the subjects' preferred home design features, their use, and their connection with cultural and religious practices. Recurrent statements, grouped into coded categories, and their frequency are shown in Figures 4.21–4.26.

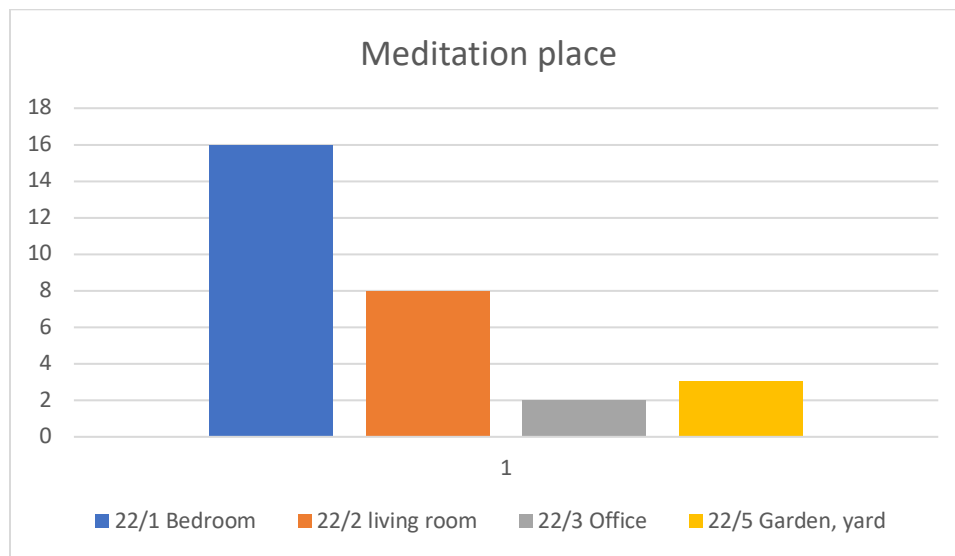
Q22. Could You Describe the Place in Your Home that You Use for Practicing Meditation or Relaxation?

In relation to this question where there were $N = 29$ occurrences, all participants (100%) associated the practice of meditation to religious practices. As reflected in Figure 4.21, most participants preferred to practice meditation or prayer in their bedroom ($n = 16$). The living room was mentioned $n = 8$ as the preferred location for meditation. However, subjects also responded that they either did not have a preferred location for

meditation, or they engaged in this practice in a couple of different areas in the home, such as living room and bedroom (n = 3) or in the garden (n = 3).

Figure 4.21

Subjects' Residence Spaces Used for Relaxation or Meditation

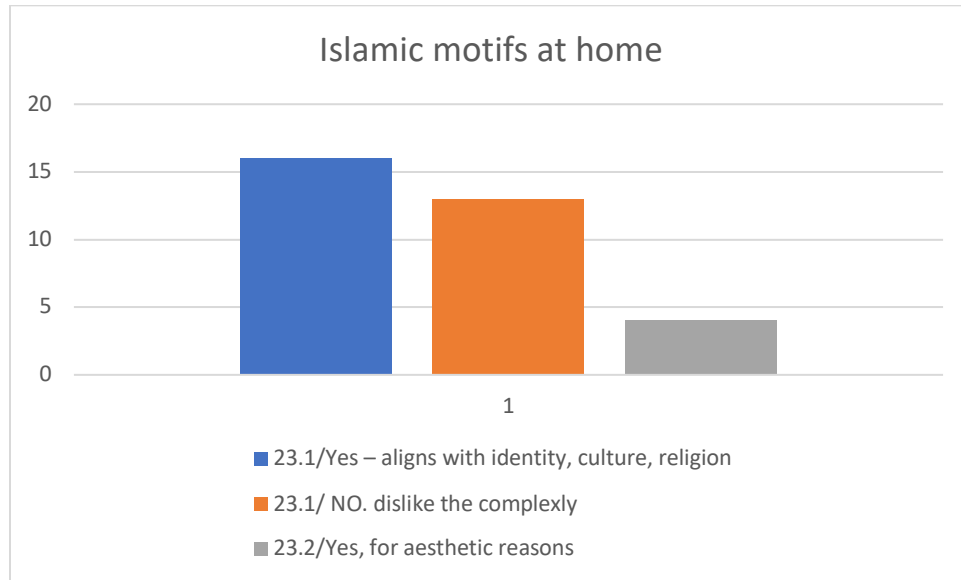


Q23. Do You Like Using Islamic Motifs for Decorating Your Home? Why?

The bar chart in Figure 4.22 illustrates the most frequent occurrences in the responses about Islamic motifs preference (n = 20 out of N = 30 occurrences). These were split among two given reasons: for aesthetics (n = 4), and for cultural-religious identity (n = 16). The second most frequent statement (13 occurrences) was dislike for the use of Islamic motifs designs, given that they are not simple designs (i.e., they are too visually complex, and thus not to their taste).

Figure 4.22

Preference for the Use of Islamic Motifs for Subjects' Home Decorations

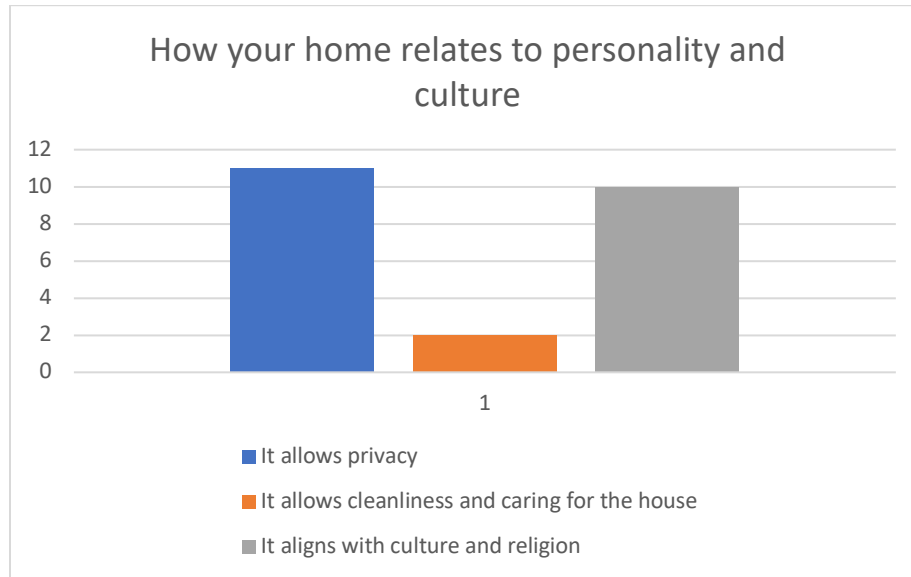


Q24. How does Your Home Design Relate to Your Personality and Culture?

Affording privacy was the reason provided most often by participants when asked about how their home relates to personality and culture. The bar graph in Figure 4.23 shows that the majority of statements within subjects' answers, $n = 31$ out of $N = 33$ occurrences, expressed the alignment of their home design with Saudi culture and religion, including affording high privacy. Two occurrences claimed aligning by virtue of the home's facilitation of its care and maintenance.

Figure 4.23

Perceived Fit of Subjects' Home Design with Personal and Cultural Preferences

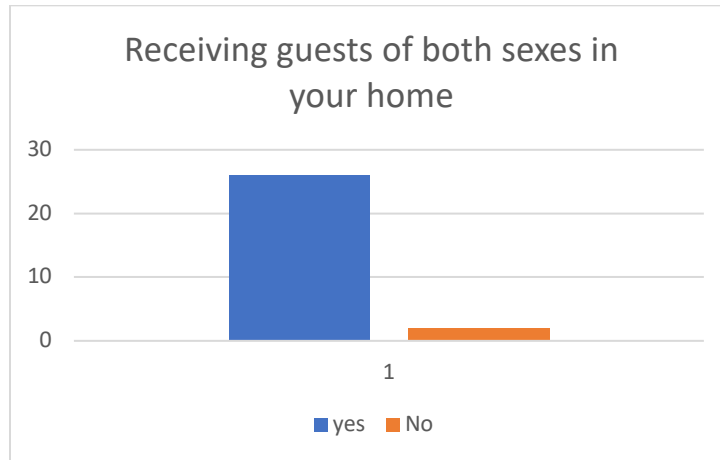


Q25. Is Your Home Design Suitable for Receiving Guests of Both Sexes?

Shown in Figure 4.24, 93% ($n = 26$ out of $N = 28$) of occurrences in the answers to this question indicated the availability of suitable separate spaces for receiving guests of both sexes in the subjects' homes. They affirmed having a special room for receiving guests, with expressions such as "The house is designed to be suitable for receiving guests from two genders," or "I have two rooms for guests."

Figure 4.24

Suitability of Subjects' Residence Spaces for Hosting Male and Female Visitors

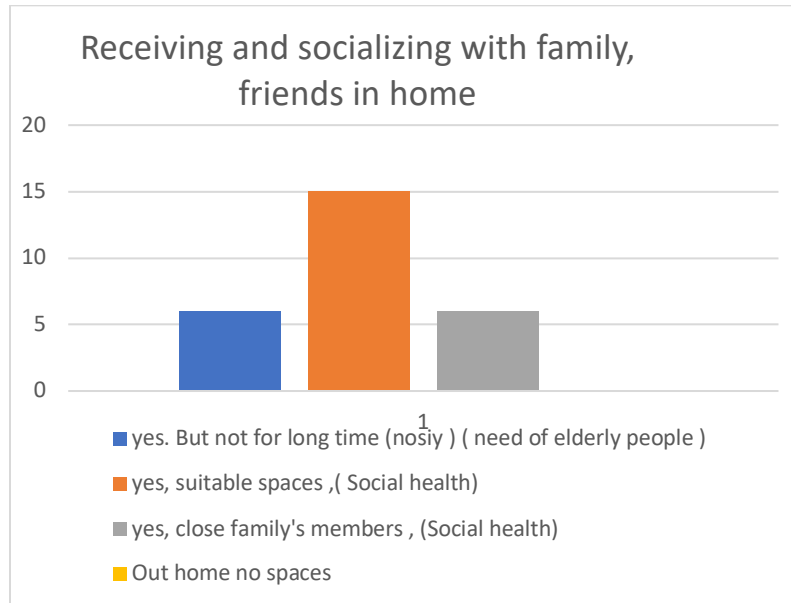


Q26. Do You Enjoy Hosting Gatherings and Socializing with Family, Friends, and Other Guests in Your Home? How?

Figure 4.25's bar graph illustrates that the most prevalent answer ($n = 21$ from $N = 31$ occurrences) favored hosting social gatherings at their home. Among these, $n = 15$ occurrences explained that their home is suitable for receiving close family members at any time, and another $n = 6$ responses indicated that the size of their house is suitable for receiving guests and friends through statements such as "My home is equipped - I have a spacious room to welcome friends and relatives." On the other hand, $n = 6$ of the $N = 31$ total occurrences indicated preference for social interaction outside of their home, as a consequence of its small size.

Figure 4.25

Preferred Spaces for Socializing at Subjects' Homes

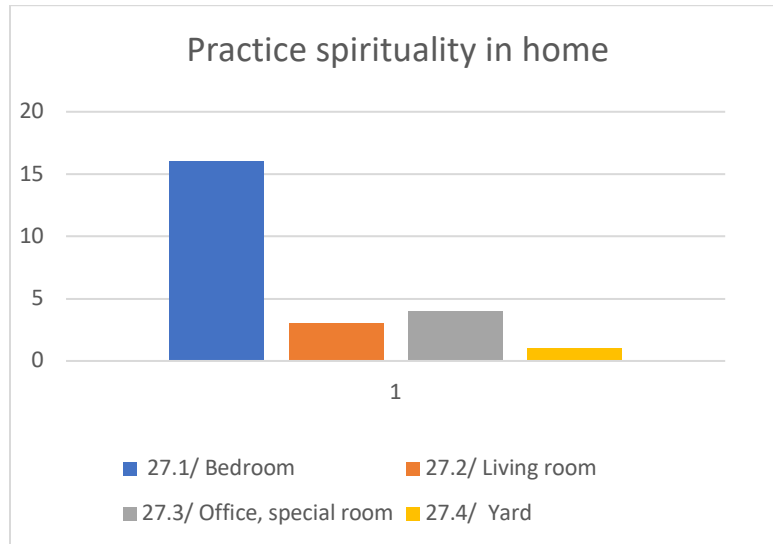


Q27. Do You Conduct Spiritual Practices at Home? How?

Within answers to this question, the most recurrent statements ($n = 16$ occurrences of $N = 24$; see Figure 4.26) indicated subjects' preference for practicing spirituality in their bedrooms. Other $n = 4$ occurrences mentioned having a special place at home for this purpose, such as the home office. This implies that a total of $n = 20$ occurrences of $N = 24$ mention the private personal quarters as the preferred place to engage in spiritual practices. Additionally, $n = 3$ occurrences mentioned a preference for the living room for spiritual practices.

Figure 4.26

Preferred Spaces for Spiritual Practices at Subjects' Homes



Results Summary

Part A: Background

Largely, on the question about reasons for preferring to live at home as they age, subjects claimed their home ownership, which falls under the occupational health dimension for successful aging. Almost half of the occurrences in coded categories referred to factors that can be associated with the dimension of environmental health while aging. The independence and convenience it allows them, the spaciousness and quality of the home, and economic advantage were also explanations.

Analysis of answers to the question on what they valued most about living at home reflect that participants again identified independence and emotional attachment to their homes, which is associated to strategies for successful aging – emotional health. These were the most reoccurring answers, as pointed out by a subject who reasoned, “My

mom was living here, I lived here since I married,” and “It is my home; it is better than I live with my son’s home or in my brother’s home.”

Analysis of the coded categories regarding preferred activities to do at home showed preference for practicing activities at home related to intellectual health. For example, reading the Qur’an, listening to lectures, playing puzzles, and watching TV. Additional recurring responses indicated engagement in household activities. Some of these activities (e.g., gardening and caring for yard plants, and exercising at home) increase physical activity, and thus also correspond to the physical health dimension of aging in place and may relate to biophilic design patterns.

Answers to the question about how the home environment supports or inhibits practicing their preferred activities suggest a tendency to be satisfied with the support provided by the home environment. About half as many participants remarked about unsuitable spaces. In both cases, these responses allude to strategies for successful aging – environmental health.

Part B: Biophilic Design

Regarding home color preferences, two thirds of the coded occurrences favored the use of natural colors (blue, white, green, yellows and gray). Another quarter preferred natural colors, as they led to relaxation and a comfortable feeling, which correspond to the emotional health dimension of successful aging. A few preferred natural, yet practical, colors that are easy to care for, such as dark reds and browns. The rationale is that these colors will ease their daily chores, which relates to a disposition toward engaging in home maintenance activities and thus to physical health.

About a third of occurrences within the coded categories related to preferences for home materials favored natural materials that again, are easier to care for, such as wood, stone, or ceramics. Similarly, these answers correspond to the physical health dimension of successful aging. In second place, a slightly lower number of occurrences favored the same materials but for aesthetic reasons, aligning with the emotional health dimension.

Despite their preferences, interviewed subjects claimed to not care about using local materials or products at home; to them, the most important criterion reported was the quality of the materials and products. Predominantly subjects were indifferent about the source of the materials used in their homes; but emphatically two thirds of them insisted on caring about their quality. These results do not support appreciation for sustainable materials sourcing, however they still build a case for a connection with the environment health dimension of successful aging.

Answers to the question about the exterior environment features surrounding the subjects' homes were corroborated through researcher observations. From the subjects' coded responses, less than a third claimed having their own gardens, while one half claimed not having natural features such as landscaping close to home; nonetheless indicating awareness of the trees, palms, and flowers in the surrounding streets, or of their neighbor's trees, which they liked. Overall, subjects had access to natural views from their homes, which is connected to strategies for successful aging in place – environmental health. A few subjects demonstrated a desire to have natural landscaping such as public parks surrounding their home, which they hoped would help them to

socialize with others and provide opportunity to exercise (walk). These responses relate to the physical health and social health dimensions of successful aging.

Nearly all responses to the question about the subjects' interest in visiting natural regions (places that offer greenery or forested mountains) were positive. The comments contained in these answers referenced expressions of emotional health, such as "The sound of water enhances my mood," and "It calms my nerves and my pressure." Secondly, the responses referenced physical health, e.g., "It encourages me to walk." There were also a few expressions indicting that being close to nature enhanced their spirituality, e.g., "Natural views help me practice meditation and to be close to God," corresponding with the spiritual health dimension of successful aging.

Subjects were asked for opinions on their interest on home design features that would allow them to feel the natural changes in air temperature and humidity from the environment. Almost 90% of all statements about this question revealed a preference for natural ventilation, with about 70% indicating that their preference was due to the feature's ability for thermal comfort improvement, i.e., to avoid increased temperature indoor.

A related question asked about their preference for sunlight access into the home. Again, about two thirds of all comments made in response to the question alluded to preferring access to sunlight at home, with half of them considering sunlight as a source of power and health, which is related to physical health. These responses align with aging in place strategies – environmental health.

Regarding preference for natural aromas and scents, there appears to be a strong preference toward perfuming the home environment, particularly with the use of powder incense, a type of natural air freshener commonly used in Saudi Arabia, but also for aromatic scents from other sources. Outcomes suggest that this preference relates to evoking feelings and emotional attachments, connecting the sensing of natural aromas with the emotional health dimension of successful aging.

An opposite reaction was prompted by the question about the use of animal motifs for home decoration. The totality of coded occurrences in the responses manifested rejection of any kind of animal motifs in their home. This reflects the culture of Saudi Arabia, for which the practice of housing animals in the home environment would not be conducive to a healthy environment, thus tying with religious practices discouraging their graphic representation. In light of the culture, this outcome relates to the successful aging dimension of environment health.

Similarly, when asked about their preference for having animal pets at home, almost 50% of the statements in the coded categories reflected elderly people's refusal to deal with animals at home in order to keep it clean, which is a cultural custom. This might correspond to the physical health dimension for successful aging, given that the lack of animals at home helps to keep their home clean for a longer time, thus requiring less maintenance effort. On the other hand, less frequent statements expressed that keeping small animals like fish or birds would be acceptable to add a good feeling at home. For example, some pointed out the sound of birds in the morning as creating an enjoyable feeling. The biophilic design pattern direct contact with animals that is

addressed in this question and its responses, corresponds to the emotional health dimension of successful aging.

A final question in this group asked about preferences for hearing natural sounds at home. Preference for natural sounds was claimed for emotional reasons in two thirds of comments, while a minority preferred natural sounds but only outdoors. In both cases this suggests a direct relationship to successful emotional aging.

Part C: Saudi Culture Design

Regarding preference for conducting spiritual practices at home, all 27 occurrences obtained from the responses related to practicing meditation or prayer some place at home. Outcomes tell us that most participants, about 60%, prefer to practice meditation in their bedroom, and about 30% in the living room. These responses directly connect to the spiritual health dimension promoting successful aging. A less frequent preference was to practice meditations in their yard, e.g., “In my garden in yard,” or “In the front yard in the morning at sunrise.” This speaks to the overlap between the biophilic pattern, “direct experience of nature,” and enhanced spiritual health.

Preferences for the use of Islamic motifs in home decoration were split almost evenly among participants, where two thirds supported their preference for reasons corresponding to their emotional health—such as cultural identity or aesthetics, and in contrast, the remaining few disliking Islamic motifs on the grounds of that the designs were too complex. This translates to rejection of visual complexity, which can be related to the intellectual health dimension of successful aging. Nonetheless in general, all the positive occurrences in the question’s coded categories again suggest a possible overlap

with biophilic design given that Islamic ornamentation favors floral motifs, which are an expression of indirect experience of nature.

When asked to describe how their home might relate to their personality and culture, there was strong similarity among the subjects' explanations, with all in one way or another claiming their house was in some way an expression of their selves. Approximately 66% of coded content indicated their perception that their home related to their personality and culture by allowing high privacy. Sample responses were "My yard has a high wall," and "I have three long layers of curtains on each window for keeping the privacy of our home from the outside." Meanwhile others attributed this to the use of a design that expresses their culture and identity in terms of layout and amenities that are characteristic of homes in Saudi Arabia, e.g., "My home is related to my culture, the majelas or male guests' room has floor seating," and "Male guests' room is completely separate from the home. It is in the front yard." These arguments seem to correspond with the emotional health and social health dimensions of aging in place, signaled by the ability to understand one's feelings that can be encouraged through personal history, create balance in life, help cope with challenges, and behave in trustworthy and respectful ways (The Seven Dimensions of Wellness—International Council on Active Aging, n.d.).

Along the same lines, responses to the following question revealed that almost all participants have a suitable place for receiving guests of both genders in their homes, in the Saudi tradition, irrespective of house size or type. The great majority of occurrences confirmed the widespread practice of having distinct rooms for receiving guests of each

gender. This was captured in statements such as “We have two rooms for guests, one for men—in the yard—and a second for women, inside the home.”

Preference for hospitality, an anchor of Saudi culture, was expressed in the frequency of occurrences favoring hosting others and engaging in social interaction at home. A limited number of occurrences indicated preference for social communication outside of their home, given the small size of it.

Finally, outcomes of the last question probing the preferred home location for spiritual practice, identified the private areas of the home, principally the bedroom, as the preferred place to engage in spiritual practice. This preference is evidence of the desirability for having these home areas in a culture that puts a premium on enhancing spiritual practices, which is also consistent with the spiritual health dimension for successful aging.

Triangulation Results

The final analysis of the study subjects’ preferences as indicted in questionnaire answers entailed their assessment against the Dimensions of Successful Aging (The Seven Dimensions of Wellness—International Council on Active Aging, n.d.); Biophilic Design Patterns (Browning et al., 2014); and the traditional residential design characteristics of Saudi culture. The assessment sought to reveal how each one of the preferred home environment features might coincide with each of these three sets of criteria, thus indicting any agreement that might lead to creating a list of residential design strategies that are biophilic and simultaneously support successful aging and the expression of Saudi culture. Results of this assessment are presented in Table 4.1.

Table 4.1

Assessment of Preferred Home Environment Features in Reference to Biophilic Design Patterns, Dimensions of Successful Aging, and Culturally Appropriate Saudi Residential Design

Question	Items satisfying both Biophilia and Successful Aging	Items satisfying both Successful Aging and Saudi Culture	Items satisfying all three criteria	Items satisfying both Biophilia and Successful Aging, and do not contradict Saudi Culture
Q9. How does your home environment support or inhibit these activities?	<p>Suitable Spaces (n = 22 of N = 27)</p> <ul style="list-style-type: none"> - I have plant in yard - Big window in my room overlook to yard. - I have small garden in yard - I have my bookcase in living room - I have treadmill machine - I love read in my room (corner reading) - I have sewing tools at my home <p><i>Correspond with Intellectual and physical health - and Direct Experience of Natural (plants)</i></p>			<p>Suitable Spaces (n = 22 of N = 27)</p> <ul style="list-style-type: none"> - I have plant in yard - Big window in my room overlook to yard. - I have small garden in yard - I have my bookcase in living room - I have treadmill machine - I love read in my room (corner reading) - I have sewing tools at my home <p><i>Correspond with Intellectual and physical health - and Direct Experience of Natural (plants)</i></p>
Q10. What do you appreciate/value about living at home? Please explain.		<p>10.1 independence (n = 22 of N = 35)</p> <ul style="list-style-type: none"> - Independent in my home - It is my home - It is Our home 		

		<i>Correspond to emotional health and Culture</i>		
Q11. Are there any colors you like to use in your home? Why those colors?	<p>11. natural colors (n = 17 of N = 34) because they provide comfort</p> <p><i>Correspond with emotional health and Indirect experience of nature - Natural color</i></p>			<p>11. natural colors (n = 17 of N = 34) because they provide comfort</p> <p><i>Correspond with emotional health and Indirect experience of nature - Natural color</i></p>
Q12. What sort of materials do you prefer to use for furnishing and/or on the interior surfaces of your house?	<p>12.3 Natural materials for practical reasons (n = 13 of N = 31)</p> <p><i>Correspond with physical and emotional health and Indirect experience of nature - Natural material</i></p>			<p>12.3 Natural materials for practical reasons (n = 13 of N = 31)</p> <p><i>Correspond with physical and emotional health and Indirect experience of nature - Natural material</i></p>
Q13. What do you think about using local materials and products (from KSA)?		<p>13.1 Quality 25 of 33. The most important thing is the quality of products</p> <p><i>Related with Emotional health and Culture</i></p>		
Q15. Do you like to travel to a naturalistic region? Please explain why yes or no. (vision - naturalistic)	<p>15.1 yes, for emotional reason n = 22 of N = 32</p> <p><i>Related to Emotional health and Direct Experience of Natural (plants, light, air)</i></p>			<p>15.1 yes, for emotional reason n = 22 of N = 32</p> <p><i>Related to Emotional health & Direct Experience of Natural (plants, light, air)</i></p>

Q17. What is your opinion on having natural ventilation, shading devices, exposed walls, or other means of feeling the natural changes in air temperature and humidity from the environment?	<p>17.1 thermal comfortable improvement (n = 17 of N = 24)</p> <ul style="list-style-type: none"> - If it fit with climate - If have role to enhance weather - Enter sun without hot air - In Order to control the temperature - Improving at temperature - Improving at temperature without isolated sunlight - If positive impact and doesn't bring hot air - Ventilate the house - Enter the sunrays with decline summer heat <p><i>Related to Emotional health and Direct Experience of Natural (light, air)</i></p>			<p>17.1 thermal comfortable improvement (n = 17 of N = 24)</p> <ul style="list-style-type: none"> - If it fit with climate - If have role to enhance weather - Enter sun without hot air - In Order to control the temperature - Improving at temperature - Improving at temperature without isolated sunlight - If positive impact and doesn't bring hot air - Ventilate the house - Enter the sunrays with decline summer heat <p><i>Related to emotional health and Direct Experience of Natural (light, air)</i></p>
Q18. Tell me what your feeling is toward natural aromas in your home? Having plants that small aromatic plants or natural plant oils. Would you like to have these smells in your home?	<p>Yes, Natural aromas (n = 21 of N = 29)</p> <p>Powder Incense – emotional reason (n = 7)</p> <ul style="list-style-type: none"> - Comfortable smell - Sense that I am in a clean comfortable place n = 2) <p>Natural aromas – Comfortable (n = 14)</p> <ul style="list-style-type: none"> - Enhance my mood 		<p>Yes, Natural aromas (n = 7 of N = 29)</p> <p>Powder Incense – emotional reason (n = 7)</p> <ul style="list-style-type: none"> - Comfortable smell - Sense that I am in a clean comfortable place <p><i>Related to Emotional health Indirect Experience of nature- Evoking nature</i></p>	<p>Yes, Natural aromas (n = 21 of N = 29)</p> <p>Powder Incense – emotional reason (n = 7)</p> <ul style="list-style-type: none"> - Comfortable smell - Sense that I am in a clean comfortable place n = 2) <p>Natural aromas – Comfortable (n14)</p> <ul style="list-style-type: none"> - Enhance my mood

	<ul style="list-style-type: none"> - Has strong impact to adjust my mood. - I like it too much because it is improving my mood <p>1) Desired-other natural aromas (n = 7)</p> <p><i>Related to Indirect Experience of nature - Evoking nature and Related to emotional health</i></p>			<ul style="list-style-type: none"> - Has strong impact to adjust my mood. -I like it too much because it is improving my mood <p>1) Desired-other natural aromas (n = 7)</p> <p><i>Related to Indirect Experience of nature - Evoking nature and Related to emotional health</i></p>
Q19. What your relationship with the pets? What do you think about getting animals within your compound or home environment?		<p>Relation with pets: Negative – difficult to care for (n = 12 of N = 28 occurrences)</p> <ul style="list-style-type: none"> - Could make home dirty and they need too much care. - It is a source of chaos and lack of cleanliness. <p><i>Related to Physical health and Culture</i></p>		
Q20. Do you like natural sounds in your home? For example, sound of water (fountains), sound of birds, the sound of wind and foliage?	<p>20.1 yes, comfortable & Emotional reasons (18 = n of N = 27 occurrences)</p> <ul style="list-style-type: none"> - The sound of fountains and birds' sound is attractive me. - Like water sound it is comfortable sound of bird is happiness and joy sound. - I like to run the fountain in the yard 			<p>20.1 yes, comfortable & Emotional reasons (18 = n of N = 27 occurrences)</p> <ul style="list-style-type: none"> - The sound of fountains and birds' sound is attractive me. - Like water sound it is comfortable sound of bird is happiness and joy sound. - I like to run the fountain in the yard

	<p>- It is express to happiness</p> <p><i>Related to Emotional health and Indirect experience of Nature - Evoking nature</i></p>			<p>- It is express to happiness</p> <p><i>Related to Emotional health and Indirect experience of Nature - Evoking nature</i></p>
Q21. Do you like to have sunlight at your home?	<p>21a./21b. yes, powerful and healthy. (n = 14 of N = 26 occurrences)</p> <ul style="list-style-type: none"> - Source of power and vitamin D -Clean and Vitamin D - Make me active - Make us have energy - Sun light renew me - New day energy - Increased active and power - Makes you feel alive Inviting activity - Natural disinfectant - It renews me active and vitality <p><i>Related to emotional health and physical health and Direct Experience of Nature - Nature – Light</i></p>			<p>21a./21b. yes, powerful and healthy. (n = 14 of N = 26 occurrences)</p> <ul style="list-style-type: none"> - Source of power and vitamin D -Clean and Vitamin D - Make me active - Make us have energy - Sun light renew me - New day energy - Increased active and power - Makes you feel alive Inviting activity - Natural disinfectant - It renews me active and vitality <p><i>Related to emotional health and physical health and Direct Experience of Nature - Nature – Light</i></p>
Q23. Do you like your home to include any kind of Islamic motifs? Please explain why yes or no			<p>23.1. Yes – aligns with identity, culture, religion (n = 16 of N = 30 occurrences)</p> <p><i>Corresponds with emotional health and corresponds</i></p>	<p>23.1. Yes – aligns with identity, culture, religion (n = 16 of N = 30 occurrences)</p> <p><i>Corresponds with emotional health and corresponds</i></p>

			<i>with Experience of Nature) Image of nature. and Experience of space and place - culture and ecological Attachment to place.</i>	<i>with Experience of Nature) Image of nature. and Experience of space and place - culture and ecological Attachment to place.</i>
Q24. Tell me how your home relates to your personality and culture		<p>It aligns with culture and religion (n = 22 of N = 32 occurrences)</p> <ul style="list-style-type: none"> - Islamic Arabia Styles - Islamic characteristics - Heritage of my city - It is related to my culture and religion - The guest men room has flooring seating. - Guest men's room separate completely from the home - We have the men's guest room (Majelas) in the yard. - My yard has long well - I have 3 long layers of curtains on each window for keeping the privacy of our home. <p><i>Related to emotional health and culture</i></p>		
Q25. Tell me whether your home allows		Yes, it is allows receiving guests of both sexes (n = 26		

receiving guests of both sexes		of N = 28 occurrences) <i>home support social communication which this correspond with social health</i>		
Q26. Does your home allow you to receive and socialize with family, friends, and other guests in your house? Explain why.		Yes, receiving the close family members (n = 15 of N = 31 occurrences) <i>Correspond to social health and emotional health</i>		

The resulting agreements were critically considered and later distilled into a set of 9 conceptual guidelines that satisfy the triangulation analysis criteria (see Table 4.2): (1) the provision of plants, whether indoors or outdoors; (2) the careful introduction of sunlight in the home; (3) the provision of natural ventilation; (4) the provision or fostering of natural sounds in the home; (5) the application of a natural color palette for home interiors; (6) the introduction of natural aromas that create a pleasant atmosphere; (7) the use of natural materials like clay, stone, or wood; (8) the use of Islamic decorative motifs in the home environment, and 9) the adoption of Islamic Arabic home design patterns. The latter breaks down as (A) the provision of reception spaces to accommodate guests of both sexes and (B) the provision of a space for spiritual practices in the bedroom, as well as the adoption of Islamic traditions regarding (C) the prohibition of animals indoors and (D) the use of animal motifs.

Table 4.2

Items that Satisfied Both Biophilic Design and Align (or Else do not Contradict)

KSA Culture

Findings		Successful Aging Dimensions						
		Emotional Health	Social Health	Spiritual Health	Occupational Health	Physical Health	Intellectual Health	Environmental Health
1	Existing interior plants or outdoor plants					Yes		Yes
2	Allow sunlight into the home	Yes				Yes		Yes
3	Provide natural ventilation	Yes						Yes
4	Introduce natural sounds	Yes						
5	Use a natural color palette	Yes						
6	Use natural aromas to create a pleasant indoor atmosphere	Yes						
7	Use natural materials like stone, clay, and wood.	Yes				Yes		
8	Use Islamic decorative motives	Yes						

9	Follow the Islamic Arabic Home Design							
A	Provide high privacy at home and provide spaces for receiving guests of both sexes.	Yes		Yes				
B	Provide a space for spiritual practices in the bedroom	Yes						
C	Avoid bring pets at home	Yes				Yes		
D	Avoid animal motifs	Yes		Yes				

The final step of this study entailed translating these concepts into a set of design recommendations for application in Saudi Arabia. These are the findings of this study and answer the study research question: *Which are the biophilic design strategies that may support successful aging at the home environment in Saudi Arabia?*

Discussion of these findings and their associated design recommendations follows in Chapter V.

CHAPTER V

DISCUSSION AND RECOMMENDATIONS

As the primary source of elder care, family members in Saudi Arabia feel that it is against their culture as well as shameful to let their elderly relatives be cared for in the free elderly homes that are available in the Kingdom. However, as a result of continuous social changes, there is now a trend toward more young people going abroad to further their education, as well as women taking up paid jobs, which is slowly interfering with the traditional family structure and roles (Campbell, 2015).

Added to this is the expectation that by 2030, there will be about 72.1 million older persons, more than twice their number in 2000 in Saudi Arabia (Administration on Aging, 2014). New construction will be necessary to satisfy the needs of this growing segment of the Saudi population.

Connected to this is biophilic design. Designing houses with an indoor design that connects to nature has the potential to improve the well-being and health of the elderly. Research shows that closeness to natural life improves general healing, and according to Rantakokko et al. (2018), the inclusion of natural elements for elderly residents in long-term care settings improves the quality of their life. The biophilic design strategies identified in this study can be offered to the Saudi government, the industry, and homeowners involved in renovations and new construction to help guide them in building home environments that contribute to healthy aging in Saudi Arabia.

Design Strategies

Existing Interior or Outdoor Plants

Existing interior plants or outdoor plants (e.g., yard, balcony) might be a reason to encourage the elderly to plant and increase their physical activity, which leads to physical health (Halaweh et al., 2018). Nicklett et al. (2016) assert, “Gardening has potentially strong physical health benefits for older adults” (p. 5). As discussed previously, Saudi elders in the study, who are considered a representative sample of the larger senior Saudi population, enjoy connecting to nature through activities like gardening and caring for yard plants. They were happy to say that “I have plants in the yard, my yard is big,” and “I have big window in my room overlooking the yard.” This in turn corresponds to the Direct Experience of Nature: Plants, which, according to Kellert and Calabrese (2015), “can reduce stress, contribute to physical health, improve comfort, and enhance performance and productivity” (p.13)

Therefore, providing indoor plants, or if possible terrace planters, patios, or gardens, is a design strategy that allows elders to have a hobby, remain physically active, and tap on the biophilic benefits of contact with nature while remaining at home, especially for elders in urban areas that do not have direct access to nature.

Allow Sunlight into the Home

The elders participating in the study demonstrated wanting access to sunlight. They liked the sun because they saw it as being a source of “power and health.” Certainly, daylight has a positive impact on physical health. UV rays from the solar spectrum promote development of vitamin D, which fixes calcium in the bones and delivers strength and increased activity. Their opinion corresponds with Mead (2008) who notes that “the best-known benefit of sunlight is its ability to boost the body’s vitamin D supply” (p. 3). Allowing the sun to enter the indoor environment is directly related to the Direct Experience of Nature: Light, a biophilic experience that “is fundamental to human health and wellbeing, enabling an orientation to the day, night and seasons in response to the sun’s location and cycles” (Kellert & Calabrese, 2015, p. 12). Sunlight can enter the home environment through windows and other openings and can be modulated by controlling building orientation; the type, materials, dimensions, and location of the windows; or through window coverings and other shading devices like the Arabic mashrabiya screen.

Provide Natural Ventilation

Almost all study participants expressed their desire to have natural ventilation to renew the air indoors, if it would not cause an increase in the temperature. Their preference aims toward a Direct Experience of Nature: Air. This biophilic experience relates to indoor human comfort and, therefore, to our productivity, mood, or sleep. Allowing control of air variables like temperature, humidity, and air flow in the home

environment will create the biophilic experience of air and support health and wellbeing for elders aging at home.

Access to natural ventilation and daylight in the elderly homes in Saudi Arabia should follow a specific design that corresponds to local climate conditions, which plays a role in providing a comfortable and suitable indoor environment for their indoor activities, which will support their physical and emotional health. Walker (2016) found, “The specific approach and design of natural ventilation systems will vary based on building type and local climate” (p. 2). The climate conditions in Jeddah, where the study subjects reside, is arid with very high temperatures in the summer. While other cities in Saudi Arabia have cold winters, this is not the case in Jeddah. In Jeddah, the annual temperature in August averages 89.8 °F and 73.9 °F in January, the coldest month, with virtually no rainfall (Climate Data, n.d.). Consideration of the windows is essential for implementing the recommendations “Allow Sunlight into the Home” and “Provide Natural Ventilation.”

Reducing window area may not be a realistic or desirable strategy in hot regions because of the need for daylight, views, and natural ventilation. Significantly reducing window area to reduce energy use is no longer necessary if highly efficient windows are used. In general, the orientation of windows or balconies in the building impacts the interior atmosphere. In the northern Hemisphere, where Saudi Arabia is located, east- and west-facing windows receive excessive sunlight in summer, while south-facing windows receive no direct sunlight in winter and receive late afternoon sunlight in the summer.

Because of this, the location of the window in the building is an important consideration for enhancing the natural interior atmosphere-

One way to tamper this is through adequate roof insulation and sloping the roof in a windward direction so that it reflects the radiation and does not absorb heat (Building et al., 2014). Other strategies, like those proposed by Almerej (2015), offer natural cooling, protection against desert sandstorms, and views of vegetation in enclosed courtyards by relying on strategic positioning of the building in the site, and the windows and openings in the building. These strategies allow bringing light indoors, achieves shading without compromising views to the surrounding vegetation, and allows breezes that moderate the indoor temperature. Importantly these strategies address the local climate and also agree with biophilic design patterns.

In addition, maintaining growing vegetation around the house helps to reduce the hot temperature, thus enhancing the indoor and outdoor air. Despite the hot climate of Jeddah, it is possible to have natural plants surrounding the home complexes. Researcher observations as well as subjects' answers to questions on surrounding natural features and plants demonstrated that the climate of Jeddah does not hinder the presence of plants, as there are abundant outdoor plants—both potted plants and shade trees—as well as reflective glass in the houses to control for climate. This is seen in Figures 5.1 and 5.2.

Figure 5.1

Photographs from Participants' Homes: Outdoor Plant in Front Yard; Glass Wall on the Second Floor of the Home (Mona, 2019)



Figure 5.2

Outdoor Evening Images Providing Examples of Shade Trees (Mona, 2019)



Introduce Natural Sounds

Older adults who participated in the study appreciated natural sounds and related them to positive emotions, confirming a relationship to both successful emotional aging and biophilic design, and fostering an Indirect Experience of Nature via the sounds of nature. The International Well Building Institute (2011) indicates that the existence of trees around the building can attract the nesting of birds in some regions. The sounds of birds chirping may allow the elderly to reconnect with the natural environment from the one in which they live, potentially enhancing their health and well-being. Planting vegetation, creating shaded areas where trees and fauna may grow is a means of bringing the sounds of nature into the home. Other natural sounds, such as water trickling in a

fountain or the sounds of rustling leaves, can be introduced in the home environment by, for example, the inclusion of fountains in courtyards and gardens or from operable windows that let the breeze in.

Use a Natural Color Palette

Natural colors foster a positive emotional experience. The study participants had a range of preferences about color, with most favoring light shades of blue, green, yellow, grey, and white—all of them associate with natural landscapes, the sea, and the sky—and claiming that these colors led to relaxation and comfort. Additional preferences leaned toward earthy colors (browns, reds), which are also found in nature, and were identified as practical. Even if their choices possibly stemmed from their ease of cleaning and the need of elderly people to be able to take care of their home with ease, these colors are part of the palette of nature and can foster the physical health dimension of successful aging as well as the biophilic Indirect Experience of Nature: Colors of Nature.

Natural colors in the home environment can be implemented by applying interior paint and other finish materials within this palette or by selecting finishes, furniture, or textiles made with natural materials that inherently present natural colors.

Use Natural Aromas to Create a Pleasant Indoor Atmosphere

A large majority of study participants expressed positive feelings toward natural aromas, asserting that pleasant smells positively affected their mood. They said, “Natural aromas makes me feel as if living in a clean area,” or “I feel comfortable when I smell a natural aroma like powder incense.” Bakoor, or powder incense, is made by mixing amber, musk, sugar, and essential oils, creating a signature aroma of strictly natural

origin. Powder incense and other types of scented substances are traditionally burned in ornate receptacles, which can be included among the resident's furnishings. Use of this scent to perfume the home environment is part of the Saudi culture. Studies have shown the positive effects of natural aromas as a way of healing a person's mind, body, and soul (Sowndhararajan & Kim, 2016). This strategy converges the emotional health dimension of successful aging as well as the Indirect Experience of Nature: Smells of Nature facilitated by biophilic design. It suggests the possible benefits of using natural aromas in the elderly's homes to foster their emotional health.

Use Natural Materials like Stone, Clay, and Wood

Biophilic (natural) materials may ease daily home chores. Numbers of study participants preferred natural materials (e.g., wood and marble) because they were believed to be easier to care for and keep clean. This indicates that the natural materials used for furnishings and finishings may have a role in reducing the effort of household chores that typically cause physical problems for the elderly, such as back pain and knee problems. In this sense, using biophilic materials may support the physical health dimension of successful aging as well as the biophilic Indirect Experience of Nature by contact with natural materials.

Numerous positive claims exist about natural materials. Building Age (1897) claims that natural finishes such as hardwood, in addition to being an environmentally friendly choice, are durable, easily kept clean, and may also keep the home environment healthier. According to Akidiri et al. (2012), natural materials are generally lower in energy and toxicity than manufactured materials. Additionally, being surrounded by

natural materials at home may also have the power to positively contribute to the residents' social and emotional wellbeing. Regarding biophilic design, Browning et al. (2014) claim that this strategy can both foster place attachment and evoke pleasurable sensations:

A Material Connection with Nature is material and elements from nature that, through minimal processing, reflect the local ecology or geology to create a distinct sense of place. Therefore, they can feel rich, warm, and authentic, and sometimes, stimulating to the touch... (p. 40)

which has the potential to induce an indirect experience of nature.

Further, even though study subjects did not count using local materials for home environment finishes as a preferred strategy, natural materials that are familiar and evoke the location may help strengthen a person's connection with their surrounding nature. Africa et al. (2019) point out that the most noticeable feature of the applications of biophilic design, distinguished from other projects, is their ability to work with the surrounding environment either indoor or outdoor, which among others, encompasses the materials of the building. A richer biophilic experience would arise by using local materials to elicit cultural and ecological attachment to place.

Use Islamic Decorative Motifs

The interviews made clear the participants' preference for using Islamic motifs in their home décor, arguing that these motifs reflect their culture and religious tendencies. Some of them also pointed out that their whole homes are linked to their culture, given the prevalence of this type of ornamentation throughout their residential spaces.

In the Islamic tradition, as noted in Chapter III, ornamentation has been preferentially evocative of plant life, which is highly prized in desert environments. As suggested by Jiwani (2011), Safiq (2014), Cuddon (2013) and others, Arabic Islamic motifs consist of variations on vines and flowers that repeat and intertwine in direct reference to nature. Others are stylized or geometrised and repeated multiple times in symmetrical yet complex organizations to suggest spiritual concepts of order and the infinite. Use of this design strategy, which is fully embraced by Saudi culture and a favorite of the study respondents, is conducive to a biophilic Indirect Experience of Nature through exposure to naturalistic shapes and forms, natural geometries, and evoking nature.

The homes visited in the study featured rooms with Arabic designs that express the Arab-Islamic culture in Saudi Arabia. Participants justified their preferences on the basis that “I like Islamic motifs because of it,” “It is related to my culture,” “I have Islamic characteristics in my sitting room,” or “I have some heritage decor in my home.” Using Islamic motifs corresponds with support for the elders’ physical and emotional health and the indirect experience of Nature: Natural Materials. Figures 5.3 and 5.4 show the abundant presence of Islamic motifs in the participants’ homes as applied ornamentation in the rug and on the ceiling as well as in the wood frame of the seating, and the vegetal and geometric ornamentation on the ceilings and walls.

Figure 5.3

Application of Islamic Ornamentation in Participants' Homes: Vegetal and Calligraphy (Mona, 2019)



Figure 5.4

Application of Islamic Ornamentation in Participants' Homes: Vegetal and Geometric (Mona, 2019)



Follow the Islamic Arabic Home Design

Every society has its customs, traditions, and religious values, which are clearly reflected in its life and urban patterns. The outcomes of this study confirm the expectations that elderly people in Saudi Arabia have in this regard, and which call for specific design strategies to ensure their successful aging in a comfortable environment. This includes the use of vegetal and geometric motifs that are part of the culture, as discussed previously, but also the use of other ornaments and objects of Islamic character in their homes that reflect their culture and religious tendencies. This was found highly desirable when expressed by the participants as “I have Islamic Arabic styles [in my

home].” This indicates that this design strategy supports the biophilic design Experience of Space and Place: Cultural and Ecological Attachment to Place, while also promoting emotional health.

Additional design strategies identified in this study aim at supporting religious and spiritual practices at home, providing privacy and allowing for hospitality.

Provide High Privacy at Home and Provide Spaces for Receiving Guests of Both Sexes

The need for privacy, particularly visual and spatial privacy in the interior home spaces, is an essential feature of Islamic culture, and according to Omer (2015), the main factor that shapes how Muslim homes are planned, built, perceived and used. For Saudi elders participating in this study it was clear that privacy of home is very important, not only for the family and homeowners. This quality was important also for the purpose of offering the necessary privacy for guests of both sexes, as in the Arabic tradition the concept of privacy involves the physical separation of the genders. This is accomplished by providing separate reception spaces to ensure that guests are comfortable during their visit, as guest comfort and satisfaction are important cultural expectations and encouraged by Islamic religion.

These design patterns are expressed in the typical layout of the Saudi residences, even when updated to modern times. The floor plans shown in figures 2.10 and 2.11 (see Ch. II) reflect their implementation in present-day, medium-sized apartments suitable for parents who no longer have a large household and are aging in place by themselves. Even there, the layout includes separate spaces for receiving guests, as well as separate entrances for the genders. These spaces are exemplified in Figure 5.5.

Figure 5.5

**Images of Rooms Providing Privacy and Spaces for Receiving Guests of Both Sexes
(Men Guests Rooms; Mona, 2019)**



Providing this kind of privacy, whether for the guests of the elderly or the elderly themselves, has a direct positive impact on achieving emotional and social health for the elderly. Good design, in line with customs, will enable the elderly to receive their friends and loved ones and will keep them in social contact with them. As a result, it will contribute to achieving positive social and emotional health for them and deliver the biophilic design Experience of Space and Place: Cultural and Ecological Attachment to Place.

Provide a Space for Spiritual Practices in the Bedroom

As discussed in Chapter II, the Islamic religion is considered the basic constitution of Saudi Arabia, and is codified into a set of beliefs, values, and behaviors deeply embraced by all Saudi citizens as guidance for their decisions and model for their behaviors. Islam is said to rest on the “Five Pillars,” one of which is the Salat—or daily prayer.

The five pillars of Islam comprise five official acts considered obligatory for all Muslims are the shahadah (witnessing the oneness of God and the prophethood of Muhammad), regular observance of the five prescribed daily prayers (salat), paying zakah (almsgiving), fasting (sawm; siyyam) during the month of Ramadan, and performance of the hajj (pilgrimage during the prescribed month) at least once in a lifetime. (Oxford Reference, n.d.)

Daily prayer is performed five times a day, involving kneeling and bowing toward Mecca as indication of their reverence and submission to Allah. Practice of the Salat and associated meditation requires a dedicated prayer space where a clean carpet can be laid down and prayer can be performed undisturbed. Provision of such spaces in the home environment, ideally in the bedroom as suggested by the study participants’ preferences,

supports the practice and thus the spiritual dimension of successful aging and the biophilic design Experience of Space and Place: Cultural and Ecological Attachment to Place.

Equally important as uncovering which design strategies might support successful aging at home in Saudi Arabia through use of biophilic design strategies, is identifying what must not be done. Results from this study suggest two possible design strategies that, while encouraged by biophilic design and commonly thought to support emotional wellness in Western society, are contradictory to Islamic culture and thus discouraged in Saudi Arabia. These are the representation of animal motifs and having pets at home.

Avoid Bringing Pets Home

Keeping the company of domestic animals such as dogs and cats at home is associated with a direct experience of nature. In this study, they are considered large animals that contradict with Islamic culture in Saudi Arabia if kept at home. Participants in the study referred to not liking pets, culturally seen as unclean, in their clean homes. This contradiction does not mean the Islamic culture refuses to treat animals with respect and does not care about them at all. “Islam has never been indifferent to animals. The proofs are verses of the Quran, Sunnah, and sayings which strongly exhort Muslims to treat animals and birds with compassion, not to abuse them” (Elias, 2012). Prophet (PBUH) said,

Allah forgave to prostitute had once been forgiven, because she passed a dog panting near a well. Thirst had nearly killed him, she took off her sock, tied it to her veil, and drew up some water for her for that. (as cited in Elias, 2012)

Therefore, animal violence is prohibited in Islam; striking the animal and not providing enough food for it is not acceptable in Islam.

A Muslim can own any animal in the house, but there are some conditions that must be followed to protect the people of the house and to preserve animal rights and good care. For accommodating an animal at home, the hygienic requirements of both the animal and its owner must be considered. A proper, separate shelter must be provided based on the needs and the nature of the animal. For a bird, for example, a comfortable cage indoors suffices, whereas large animals must be kept outdoors. The excrement and urine of some birds and animals are impure (Najis), hence, keeping them indoors needs attention (Complete Risalah Amaliyah).

These recommendations explain why most elderly people refuse to own an animal at home in KSA, where it may be a cause of dirt in the house. Consequently, owning an animal can carry the need for additional household chores that increase the owners' physical exertion and may adversely affect their physical health.

Avoid Animal Motifs

Similarly, the use of animal motifs is another biophilic pattern that clashes with the Islamic culture of KSA. To the study participants, no type of animal motifs were acceptable in the home, indicating that they do not align with the regulations of Islam. In light of this restriction, art historians explain that Islamic artists do not attempt to replicate nature in the form of the bodies of animals or humans, but instead, they try to show what nature represents (Yusof, 2011).

Conclusion

Providing the recommended design guidelines in homes for the elderly should encourage achieving comfort and emotional health as they age in place. From the point of view and experience as a Saudi citizen, the researcher realizes that in the Kingdom the design standards applied to modern homes built for the elderly fail to address the provision of a suitable environmental design thought to help the elderly to grow up independently and balanced physically and emotionally. Some even claim that there is an inverse relationship between the extent of suitability of modern homes in the presence of an older age in the home (Dr. Doctor, 2001).

Most homeowners are keener to provide design standards related to culture hospitality more than their keenness to provide a healthy and sustainable environment that helps people aging with balance and stability and less health and psychological damage. The results of this research may help change this and are recommended for children who are interested in providing a sustainable and healthy home for their parents, one that can help them achieve cultural and psychological satisfaction; or else, these standards may be currently useful as a guide for seniors who are able to redesign their own homes. The design strategies identified by this study may help start a set of guidelines for the country of Saudi Arabia when redesigning existing elderly homes for seniors who do not have children, or their children live quite a distance from them. Finally, the outcomes of the study can help developers, as they can use the design strategies of this study to create new buildings that they can market specifically to seniors.

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APPENDIX A

CODING TABLES

Question	The Most Prevalent	Biophilic Design	KSA Culture	Successful Aging (wellness)
Q7/ List reasons for living in your home all this time. (one or more)	7.2 Convenience (n = 13 of N = 49) - Suitable - Adaptable - Location - Has elevator - Public services - Good space - Expansive - Good a space for family members - Suitable for family members and their needs	Convenience	Convenience	Convenience
		No	No	Yes
				- Suitable - Adaptable - Location - Has elevator - Public services - Good space - Expansive - Good a space for family members - Suitable for family members and their needs
Q8/ Can you describe some activities that you like to do in your home?	8a.7. Intellectual Activities/	Intellectual Activities	Intellectual Activities	Intellectual Activities
	(n = 15 of N = 34) - Reading Quran	No	Yes	Yes

	<p>Listen to lectures</p> <p>Work at office</p> <p>Reading, surfing the internet.</p> <p>Following his/her business through his/her phone</p> <p>Watch tv</p> <p>- Solve puzzles</p>		<p>- Reading Quran</p> <p>Religious beliefs and practices</p>	<p>- Reading Quran</p> <p>- Listen to lectures</p> <p>- Work at office</p> <p>- Reading, surfing the internet.</p> <p>- Following his/her business through his/her phone</p> <p>- Watch tv</p> <p>Correspond with Intellectual</p>
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Q9/ How does your home environment	9.1 Suitable Spaces (n = 22 of N = 27)	Spaces are suitable for desired activities	Spaces are suitable for desired activities	Spaces are suitable for desired activities
	<p>- I love read in my room</p> <p>- Has a corner of reading</p>	Yes	No	Yes

support or inhibit these activities?	<ul style="list-style-type: none"> - I have treadmill machine - I have plants in the yard - It has a good kitchen - It has room for reading / work - I have my bookcase - My yard is big - Big window in my room overlooking the yard. - I have small garden in yard - My home is good for doing my work. 	<ul style="list-style-type: none"> - I have plant in yard - Big window in my room overlook to yard. - I have small garden in yard 		<ul style="list-style-type: none"> - I have plant in yard - Big window in my room overlook to yard. - I have small garden in yard - I have my bookcase in living room - I have treadmill machine
		<p>Related to Direct Experience of Natural (plants)</p>		

	<ul style="list-style-type: none"> - I have sewing requirements (sewing machine, sewing table) - There is no noise in my home I have a big TV/ I have phone - It is good to do my work: cleaning and cooking 			<ul style="list-style-type: none"> - I love read in my room (corner reading) -I have sewing tools at my home <p>Correspond with Intellectual and physical health</p>
Q10/ What do you appreciate/value about living at home? Please explain.	10.1 Independence	Independence	Independence	Independence
	(n = 22 of N= 35)			
	- Independent in my home		yes	yes
			Cultural	

	<ul style="list-style-type: none"> - It is my home - It is Our home - I and my husband are the owners - I have control in my home, I feel independent - I have everything that I want here - Better than living at my brother's home. - We are the owners of this home 		<i>traditions</i>	<ul style="list-style-type: none"> - Independent in my home - It is my home - It is Our home <p><i>Correspond to emotional health</i></p>
PART II: BIOPHILIC DESIGN				

Q11: Are there any colors you like to use in your home? Why those colors?	11. Natural colors (n = 17 of N = 34) because they provide comfort	Natural Colors	Natural Colors	Natural Colors
	- Light colors it is comfortable colors	Yes	No	Yes

	<ul style="list-style-type: none"> - [Colors that suggest] breadth of place (white) - Comfortable feeling (blue) - Light colors, because they are comfortable (gray, yellow, green) 	<ul style="list-style-type: none"> - Light colors - [Colors that suggest] breadth of place (white) - Comfortable feeling (blue) - Light colors, because they are comfortable (gray, yellow, green) <p><i>Related to Indirect Experience of Nature (Natural colors)</i></p>		<ul style="list-style-type: none"> - comfortable reasons <p><i>Correspond with emotional health</i></p>
Q12: What sort of materials do you prefer to use for furnishing and/or on the interior surfaces of your house?	12.3 Natural materials for practical reasons (n = 13 of N = 31)	Practicality: natural materials	Practicality: natural materials	Practicality: natural materials
	- Natural materials usually have good	Yes	No	Yes
	<ul style="list-style-type: none"> -Marble is easy to clean. -Natural materials are easy to clean -natural materials are fit for all the weather fluctuations. 	<ul style="list-style-type: none"> - Quality [colors and materials - Marble is easy to clean. 		<ul style="list-style-type: none"> - Quality [colors and materials - Marble is easy to clean.

	<ul style="list-style-type: none"> - Stay for a long time - Leather and marbles are practical materials. - Wood easy to clean 	<ul style="list-style-type: none"> - Natural materials are easy to clean - Fit for all the change of weather - Stay for a long time - Leather and marbles are practical materials. - Wood easy to clean <p><i>Related to Indirect Experience of Nature (natural materials)</i></p>		<ul style="list-style-type: none"> - Natural materials are easy to clean - Fit for all the change of weather - Stay for a long time - Leather and marbles are practical materials. - Wood easy to clean <p><i>Correspond with physical and emotional health</i></p>
Q13 / What do you think about using Local materials and products (from KSA)?	13.1Quality 25	Quality	Quality	Quality
	The most important thing is the quality of products 25 of 33	No	No	Yes
				<p>Local materials break, need better quality</p> <p><i>Related with Emotional health</i></p>

Q14/ What natural features surround the outside of your home?	No natural features (n = 17 of N = 33)	No natural features surrounding the home	No natural features surrounding the home	No natural features Surrounding the home
	- Nothing, I'm living in Apartment complex Nothing	No	Yes	No
	- Nothing plant outside - Nothing, I'm live in old residential complex		- Nothing, I'm living in Apartment complex Nothing - Nothing plant outside - Nothing, I'm live in old residential complex <i>Local geography and climate</i>	
Q15 / Do you like to travel to a naturalistic region? Please explain why	15.1 Positive emotional experience n = 22 of N = 32	Positive emotional experience	Positive emotional experience	Positive emotional experience
	- Nature vision fosters my mood	Yes	No	Yes

yes or no. (vision - naturalistic)	<ul style="list-style-type: none"> - The sound of water enhances your mood. - Nature is comfortable psychologically help me to Meditation - It calms my nerves and my pressure comfortable to look get enjoyable and sound of waves help to relaxing. - Happy & relax 	<ul style="list-style-type: none"> - Natural scene - Yes, for Emotional reason <p><i>Related to Direct Experience of Nature (air, light, water)</i></p>		<ul style="list-style-type: none"> - Natural scene - Yes, for Emotional reason <p>Related to Emotional health & Environment health</p>
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Q16: What is your opinion about animal motifs home?	No – not appropriate with culture and religion (forbidden) n = 27 of N = 27	Motifs not appropriate	Motifs not appropriate	Motifs not appropriate
		No	Yes	No
Q17 / What is your opinion on having natural ventilation, shading devices,	17.1 Improves thermal comfort (n = 17 of N = 24)	Improves thermal comfort	Improves thermal comfort	Natural ventilation
	- If it fit with climate	yes	yes	yes

<p>exposed walls, or other means of feeling the natural changes in air temperature and humidity from the environment?</p>	<ul style="list-style-type: none"> - If have role to enhance weather - Enter sun without hot air - In Order to control the temperature - Improving at temperature - Improving at temperature without isolated sunlight 	<ul style="list-style-type: none"> - If fit with climate - Role to enhance weather - Enter sun without hot air - In Order to control the temperature - Ventilate the houses 	<ul style="list-style-type: none"> - If have role to enhance weather - Enter sun without hot air - In Order to control the temperature - Improving at temperature 	<ul style="list-style-type: none"> - If fit with climate - Role to enhance weather - Enter sun without hot air - In Order to control the
	<ul style="list-style-type: none"> - If positive impact and doesn't bring hot air - Ventilate the houses - Enter the sunrays with decline summer heat - If not cause to increase the temperature. - Good idea to bring comfort atmosphere - Shouldn't cause overheating. 	<p><i>Related to Direct Experience of Natural (air, light)</i></p>	<ul style="list-style-type: none"> - Improving at temperature without isolated sunlight - If positive impact and doesn't bring hot air - Ventilate the houses - Enter the sunrays with decline summer heat - If not cause to increase the temperature. - Good idea to bring comfort atmosphere - Shouldn't cause overheating. 	<ul style="list-style-type: none"> - Temperature - Ventilate the houses <p><i>Related to Emotional health & Environment health</i></p>

			<i>Local geography and climate</i>	
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Q 18/ Tell me what your feeling is toward natural aromas in your home? Having	18.2 Preferring Natural aromas for emotional reasons (n = 21 of N = 29)	Natural aromas	Natural aromas	Natural aromas
	For	Yes	Yes	Yes

<p>plants that small aromatic plants or natural plant oils. would you like to have these smells in your home?</p>	<p>1. Desired Powder Incense – emotional reason (n = 7)</p> <ul style="list-style-type: none"> - Comfortable smell - Sense that I am in a clean comfortable place <p>2. Natural aromas – Comfortable (n = 14)</p> <ul style="list-style-type: none"> - Enhance my mood has strong impact to adjust my mood. - I like it too much because it is improving my mood 	<p>1. Desired Powder Incense – emotional reason (n = 7)</p> <ul style="list-style-type: none"> - Comfortable smell - Sense that I am in a clean comfortable place <p>2. Natural aromas – Comfortable (n = 14)</p> <ul style="list-style-type: none"> - Enhance my mood - Has strong impact to adjust my mood. - I like it too much because it is improving my mood <p><i>Related to Indirect Experience of nature- Evoking nature</i></p>	<p>Desired Powder Incense:</p> <ul style="list-style-type: none"> - Comfortable smell - Sense that I am in a clean comfortable place <p><i>Cultural traditions</i></p>	<p>Natural aromas (n = 21) for emotional health</p> <p>Powder Incense – Emotional reason (n7)</p> <ul style="list-style-type: none"> - Comfortable smell - Sense that I am in a clean comfortable place <p>2) Natural aromas – Comfortable (n = 14)</p> <ul style="list-style-type: none"> - Enhance my mood - Has strong impact to adjust my mood. - I like it too much because it is improving my mood <p><i>Related to emotional health</i></p>
<p>Q19/ What your relationship with the pets? What</p>	<p>Relation with pets: Negative – difficult to care for (n = 12 of N = 28 occurrences)</p>	<p>No pets at home</p>	<p>No pets at home</p>	<p>No pets at home</p>

do you think about getting animals within your compound or home environment?	<ul style="list-style-type: none"> - Could make home dirty and they need too much care. - It is a source of chaos and lack of cleanliness. 	No	Yes	Yes
			Difficult to care for Cultural traditions	Difficult to care for. Related to physical health

Q20/ Do you like natural sounds in your home? For example, sound of water, (fountains) sound of birds, the sound of wind and foliage?	20.1 yeas, comfortable & Emotional reasons (n = 18 of N = 27 occurrences)	Positive emotional reaction to natural sounds	Positive emotional reaction to natural sounds	Positive emotional reaction to natural sounds
		Yes	No	Yes
	<ul style="list-style-type: none"> - The sound of fountains and birds' sound is attractive me. - Like water sound it is comfortable - Sound of bird is happiness and joy sound. - I like to run the fountain in the yard - It is express to happiness 	<ul style="list-style-type: none"> - The sound of fountains and birds' sound is attractive me. - Like water sound it is comfortable - Sound of bird is happiness and joy sound. - I like to run the fountain in the yard - It is express to happiness Related to Indirect Experience of		<ul style="list-style-type: none"> - The sound of fountains and birds' sound is attractive me. - Like water sound it is comfortable - Sound of bird is happiness and joy sound. - I like to run the fountain in the yard - It is express to happiness

		<i>nature- (Evoking nature)</i>		<i>Related to emotional health</i>
Q21/ Do you like to have sunlight at your home?	21a.b/2. Yes, powerful and healthy. (n = 14 of N = 26 occurrences)	Sunlight Is Beneficial	Sunlight Is Beneficial	Sunlight Is Beneficial
	<ul style="list-style-type: none"> - Source of power and vitamin D - Clean and Vitamin D - Make me active - Makes us have energy - Sun light renew me - New day energy - Increased active and power - Makes you feel alive Inviting activity - Natural disinfectant - it renews me active and vitality 	<ul style="list-style-type: none"> Yes - Yes, powerful and healthy. - Source of power a vitamin D - make me active - Make us have energy - Sun light renew - Increased active and power - Makes you feel alive Inviting activity - natural disinfectant - it renews me - Active and vitality <i>Related to Direct Experience of Natural (air, light)</i>	<ul style="list-style-type: none"> Yes <i>Local climate</i> 	<ul style="list-style-type: none"> Yes - Yes, powerful and healthy which related to physical health. make me active - Make us have energy - Sun light renew me - New day energy <i>Related to emotional & physical health</i>

Culture				
Q22/ Could you describe to me what is the place that you wish having on your home for practicing the meditation or relaxation?	22.1- spiritual practice in bedroom n = 16 of N = 27 occurrences	Practicing meditation, relaxation	Practicing meditation, relaxation	Practicing meditation, relaxation
	- My bedroom I have corner for Pray	No	Yes	Yes
	- My bed at night - My bed rooms - My bedroom for relaxation, privacy.		<i>Religious beliefs and practices</i>	- Spiritual health
23/. Do you like your home include any kind of Islamic motifs? Please	23.1/Yes – aligns with identity, culture, religion (n = 16 of N = 30 occurrences)	It aligns with culture and religion	It aligns with culture and religion	It aligns with culture and religion
		Yes	Yes	Yes

explain why yes or no.	<p>- Yes, because it is related to my culture</p> <p>- Yes, because it is related to my religion</p>	<p>- Yes, it is related to my culture</p> <p>- Yes, it is related to my religion</p> <p><i>Corresponds with Experience of Nature)</i></p> <p><i>Image of nature.</i></p> <p><i>& Experience of space and place culture and ecological Attachment to place.</i></p>	<p>- Yes, it is related to my culture</p> <p>- Yes, it is related to my religion</p> <p><i>Religious beliefs and practices</i></p>	<p>- Yes, it is related to my culture</p> <p>- Yes, it is related to my religion</p> <p><i>Corresponds with emotional health</i></p>
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Q24/ Tell me how your home relates to your personality and culture	It aligns with culture and religion (n = 22 of N = 32 occurrences)	It aligns with culture and religion	It aligns with culture and religion	It aligns with culture and religion
	- Islamic Arabia Styles	No	Yes	Yes

	<ul style="list-style-type: none"> - Islamic characteristics - Heritage of my city - It is related to my culture and religion - The guest men room has flooring seating. - Guest men's room separate completely from the home - We have the men's guest room (Majelas) in the yard. - My yard has long well - I have 3 long layers of curtains on each window for keeping the privacy of our home. 		<ul style="list-style-type: none"> - Islamic Arabia Styles - Islamic characteristics - Heritage of my city - It is related to my culture and religion - My yard has long well - I have 3 long layers of curtains on each window for keeping the privacy of our home. <p>Religious beliefs and practices;</p> <p>Cultural traditions.</p> <p>Privacy</p>	<ul style="list-style-type: none"> - Islamic Arabia Styles - Islamic characteristics - Heritage of my city <p>Corresponds with emotional health</p>
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Q25/Tell me whether your home allows receiving guests of both sexes	Yes, it allows to receiving guests of both sexes (n = 26 of N= 28 occurrences)	Home allows receiving guests of both sexes	Home allows receiving guests of both sexes	Home allows receiving guests of both sexes
		No	Yes	Yes
	<ul style="list-style-type: none"> - We have two room for guests one for the men it is in the yard and the second one for women it is inside the home - Yes, the house is designed to be suitable for receiving guests from two genders. - Male room separated from females and this design is very smooth and good. - Yes, I have room for especially for men's guests - Guest room sprat completely - Man guest <i>Majlas</i> room in yard. - I have a section for the man it separates a bit from all home. - Ehe men's section <i>Majelas</i> is independent <i>with</i> bathroom, 		<ul style="list-style-type: none"> - We have two room for guests one for the men it is in the yard and the second one for women it is inside the home - Yes, the house is designed to be suitable for receiving guests from two genders. male separated from females and this design is very smooth and good. - Yes, I have room for especially for men's guests - Yes, I have room for especially for men's guests - Man Guest room in yard - I have a section for the man it separates a bit from all home., the men's section is independent <i>Majelas</i>, <i>Majelas</i>, and a bathroom on 	<ul style="list-style-type: none"> - We have two room for guests one for the men it is in the yard and the second one for women it is inside the home - Yes, the house is designed to be suitable for receiving guests from two genders. male separated from females and this design is very smooth and good. - Yes, I have room for especially for men's guests - Man Guest room in yard - I have a section for the man it separates a bit from all home. - The men's section is independent, <i>Majelas</i>, and a bathroom - On the other side of the house is a women's room with an independent toilet

	- On the other side of the house is a women's room with an independent toilet.		the other side of the house is a women's room with an independent toilet <i>Cultural traditions.</i> <i>Privacy</i>	<i>home support social communication which this correspond with social health</i>
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Q26/. Does your home allow you to receive and socialize with family,	26.2 Yeas, Receiving and Socializing with Family, Friends in Home (n = 15 of N = 31 occurrences)	Receiving and Socializing with Family, Friends in Home	Receiving and Socializing with Family, Friends in Home	Receiving and Socializing with Family, Friends in Home
		No	Yes	Yes

friends, and other guests in your house? Explain why.	<ul style="list-style-type: none"> - Because my relative is caused to make me happy love the family gathering, - Care about to see my grandchildren each week and drink coffee with them and eat dinner together. - Yes, my home designed to suitable to welcoming guests and gathering family - Yes, I like to gather with my family at home - I miss my children if they didn't visit my long time - Yes, I enjoyed meeting my children and their kids - Yes, I enjoy too much. No matter how wider or narrow the place - To meet with the first level of my family and people who close to me at my home 		<ul style="list-style-type: none"> - Because my relative is caused to make me happy - Love the family gathering, - Care about to see my grandchildren each week and drink coffee with them and eat dinner together. - Yes, my home designed to suitable to welcoming guests and gathering family - Yes, I like to gather with my family at home - I miss my children if they didn't visit my long time - Yes, I enjoyed meeting my children and their kids - Yes, I enjoy too much. No matter how wider or narrow the place 	<ul style="list-style-type: none"> - Because my relative is caused to make me happy - Love the family gathering, - Care about to see my grandchildren each week and drink coffee with them and eat dinner together. - Yes, my home designed to suitable to welcoming guests and gathering family - Yes, I like to gather with my family at home - I miss my children if they didn't visit my long time - Yes, I enjoyed meeting my children and their kids - Yes, I enjoy too much. No matter how wider or narrow the place
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			<p>- To meet with the first level of my family and people who close to me at my home</p> <p><i>Cultural traditions.</i></p> <p><i>Privacy</i></p>	<p>- To meet with the first level of my family and people who close to me at my home</p> <p><i>Correspond to social & emotional health</i></p>
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Responses to Q12 in relation to biophilic design.

PREFERRED MATERIALS					BIOPHILIC DESIGN																	
TOTAL	Luxurious materials	Natural Materials: Athti	Natural Materials: Ptilit		DIRECT EXPERIENCE OF NATURE					INDIRECT EXPERIENCE OF NATURE					EXPERIENCE OF SPACE AND PLACE							
					Light	Air	Water	Plants	Animals	IMAGES OF NATURE	NATURAL MATERIALS	NATURAL COLORS	SIMULATING NATURAL LIGHT AND AIR.	NATURALISTIC SHAPES AND FORMS	EVOKING NATURE	AGE, CHANGE, AND THE PATINA OF TIME.	NATURAL GEOMETRIES	BIOMIMICRY	PROSPECT AND REFUGE.	ORGANIZED COMPLEXITY.	INTEGRATION OF PARTS TO WHOLES.	TRANSITIONAL SPACES.

Responses to Q14 in relation to biophilic design.

BIOPHILIC DESIGN							
Natural Features Surrounding of home							
		DIRECT EXPERIENCE OF NATURE	INDIRECT EXPERIENCE OF NATURE	EXPERIENCE OF SPACE AND PLACE			
Total							
	Desired for thermal	Landscaped areas not	Views to nature	Desire to socialize	Exercises/Desires to		Light
	2						Air
							Water
							Plants
							ANIMALS
							WEATHER.
			9				NATURAL LANDSCAPES AND ECOSYSTEMS FIRE.
							IMAGES OF NATURE
							NATURAL MATERIALS
							NATURAL COLORS
							SIMULATING NATURAL LIGHT AND AIR..
							NATURALISTIC SHAPES AND FORMS
							EVOKING NATURE
							AGE, CHANGE, AND THE PATINA OF TIME
							NATURAL GEOMETRIES
							BIOMIMICRY
							PROSPECT AND REFUGE..
							ORGANIZED COMPLEXITY.
							INTEGRATION OF PARTS TO WHOLES.
							TRANSITIONAL SPACES.
							MOBILITY AND WAYFINDING..

Responses to Q17 in relation to biophilic design.

[illegible]

Responses to Q18 in relation to biophilic design.

[illegible]

Responses to Q20 in relation to biophilic design.

	No	Yes, outdoor	Yes, conformable	Natural sounds	
Total				DIRECT EXPERIENCE OF NATURE	BIPHILIC DESIGN
				Light	
				Air	
				Water	
				Plants	
				ANIMALS	
				WEATHER.	
				NATURAL LANDSCAPES AND FIRE.	
				IMAGES OF NATURE	
				NATURAL MATERIALS	
				NATURAL COLORS	
				SIMULATING NATURAL LIGHT AND NATURALISTIC SHAPES AND FORMS	
27	3	6	81	EVOKING NATURE AGE, CHANGE, AND THE PATINA OF NATURAL GEOMETRIES	
				BIOMIMCRY	
				PROSPECT AND REFUGE. ORGANIZED COMPLEXITY. INTEGRATION OF PARTS TO WHOLES.	
				TRANSITIONAL SPACES. MOBILITY AND WAYFINDING.	
				CULTURAL AND ECOLOGICAL	

Responses to Q21 in relation to biophilic design.

Preference for Sunlight and Reasons					
Total	Yes, sources of power and	Yes, comfortable	No, it causes to worst		
18	14	4		Light	
				Air	
				Water	
				Plants	
				ANIMALS	
				WEATHER.	
				NATURAL LANDSCAPES AND	
				FIRE.	
				IMAGES OF NATURE	
				NATURAL MATERIALS	
				NATURAL COLORS	
				SIMULATING NATURAL LIGHT AND	
				NATURALISTIC SHAPES AND FORMS	
				EVOKING NATURE	
				AGE, CHANGE, AND THE PATINA OF	
				NATURAL GEOMETRIES	
				BIOMIMICRY	
				PROSPECT AND REFUGE.	
				ORGANIZED COMPLEXITY.	
				INTEGRATION OF PARTS TO WHOLE.	
				TRANSITIONAL SPACES.	
				MOBILITY AND WAYFINDING.	
				CULTURAL AND ECOLOGICAL	

Responses to Q23 relation to biophilic design patterns.

[illegible]

APPENDIX B
IRB-APPROVED DOCUMENTS

**University of North Carolina at Greensboro
Connecting Elders to Nature: A Research Study on Using Biophilic Design to Foster
Successful Aging at Home in Saudi Arabia**

Principal Investigator: Mona Algamdi.

Phone: [REDACTED]

Email: [REDACTED]

Advisor: Maruja Torres-Ntonini phd, leed bd+c

Phone : [REDACTED]

Email [REDACTED]

IRB Study Number: 24636361

I am a graduate student at the University of North Carolina at Greensboro, in the Department of Interior Architecture. I am planning to conduct a research study, which I invite you to take part in. This form has important information about the reason for doing this study, what I will ask you to do if you decide to be in this study, and the way I would like to use information about you if you choose to be in the study.

Why are you doing this study?

You are being asked to participate in a research study on using biophilic (nature-related) design to foster successful aging at home in Saudi Arabia.

The main purpose of the study is to understand how the home environment can be used to connect the elderly with nature and offer a positive psychological and physical experience within their home environment, so that they can comfortably remain at home during their senior years. Associated objectives of this study are:

- To determine the needs of the psychological, social and physical environment of elderly people for aging at home.
- To identify the biophilic design strategies that may promote successful aging in the home environment.

- To develop culturally appropriate standards for aging at home in Saudi Arabia with the inclusion of biophilic design strategies.

1.3 Research questions

From the objectives of the study, the following research questions have been formulated to guide the study.

1. Which are the biophilic design strategies that may support successful aging at home in Saudi Arabia?
2. Which are the culturally appropriate strategies that may support successful aging at home in Saudi Arabia?
3. Which are the established aging-in-place design strategies that may support successful aging at home in Saudi Arabia?

What will I do if I choose to be in this study?

You will be asked to:

Provide a clear answer and clear information

Give me permission tour your home with you to observe and discuss with you its interior design.

Study time: Study participation will require one visit to your home for approximately two hours.

Study location: All study procedures will take place at your home.

I would like to audio-record this interview to make sure that I remember accurately all the information you provide. I will keep these tapes in a recording device not linked to the internet, there will be a password to access the responses from the participants, and they will only be used by me. If you prefer not to be audio-recorded, I will take notes instead. Recordings will be kept under lock in a secure place for the duration of the study and will be erased/deleted at its conclusion.

What are the possible risks or discomforts?

Your participation in this study does not involve any physical or emotional risk to you beyond that of everyday life.

What are the possible benefits for me or others?

You are not likely to have any direct benefit from being in this research study. This study is designed to learn more about the best home design for elders in Saudi Arabia. As such, the study results may be used to help other people in the future.

How will you protect the information you collect about me, and how will that information be shared?

Results of this study may be used in publications and presentations. Your study data will be handled as confidentially as possible. If results of this study are published or presented, individual names and other personally identifiable information will not be used.

Financial Information

Participation in this study will involve no cost to you, and you will not be paid for participating in this study.

What are my rights as a research participant?

Participation in this study is voluntary. You do not have to answer any question you do not want to answer. If at any time and for any reason, you would prefer not to answer a specific question, you may skip that question. Responses to questions should only provide the level of detail and information that you are comfortable with sharing. If at any time you would like to stop participating, please tell me. We can take a break, stop and continue at a later date, or stop altogether. You may withdraw from this study at any time, and you will not be penalized in any way for deciding to stop participation. If you decide to withdraw from this study, I will ask you if the information already collected from you may be used.

Who can I contact if I have questions or concerns about this research study? If you have questions or concerns about this study, you are free to ask me now or at any time. You also have the option of contacting my professor at the University of North Carolina Greensboro using the contact information below.

1) Dr. Maruja Torres-Antonini

Associate Visiting Professor and Director of Graduate Studies

Department of Interior Architecture | The University of North Carolina Greensboro
527 Highland Avenue, Greensboro NC 27402

Phone: [REDACTED]

Email: [REDACTED]

2) Mona Algamdi

MFA Candidate

Department of Interior Architecture | The University of North Carolina Greensboro

Phone: [REDACTED]

Email : [REDACTED]

Consent

I have read the consent form and the research study has been explained to me. I have been given the opportunity to ask questions and my questions have been answered. If I have additional questions, I have been told whom to contact. I agree to participate in the research study described above and will receive a copy of this consent form.

Participant's Name (printed)

Participant's Signature

Date

Recruitment Flyer

Connecting elders to nature. A study on using biophilic design to foster successful aging at home in Saudi Arabia.

What is the Purpose of the Study?

This study aims to identify to what extent biophilic design—design with natural, or nature-oriented, components—contributes to creating a friendly home environment for the elderly in Saudi Arabia. the study focuses on culturally relevant biophilic design that aligns with design patterns typical of the Islamic culture. The goal of the research is to identify a set of design strategies that combine these components to foster successful aging in place.

Who can be a Participant?

I am looking for volunteers to participate in this study. To be eligible to participate in the study, you must be between 47-99 years old. This is a voluntary study and there is no compensation for participating. This is a low-risk study, with no anticipated harm to participants.

What Happens?

I will visit your home one time, where I will ask you several questions about your living environment. As a part of the interview, you will also be asked to walk me around your home and respond to questions related to your preferences for the structure and style of your home. This visit will last approximately one to two hours.

How do I Sign Up?

If you are interested in participating in this study, please contact me.

Name: Mona Algamdi

Phone: [REDACTED]

Email: [REDACTED]

What if I Change My Mind?

I am looking for voluntary participants. If at any time during the study, you decide you do not want to participate, you may withdraw from the study. There will be no negative consequences for removing yourself from the study.

Interview Questions

Dear Participant,

Thank you for agreeing to participate in this study. My name is Mona and I am a graduate student at the University of North Carolina at Greensboro, Greensboro North Carolina in the United States. While I am home in Saudi Arabia for the summer, I am conducting research as part of my master's degree in Interior Architecture. The purpose of this INTERVIEW is to collect data on assessing how biophilic design can create a suitable environment for people older than 50 through the provision of suitable aging at home. Biophilia means "the hypothetical human tendency to interact or be closely associated with other forms of life in nature." Basically, I am interested in the ways that natural environments within our homes may help us feel better as we get older. There are four sections to this interview. In Part (A) demographic questions providing contextual information for the study to determine if you meet the criteria for the study. Also, information about your current living conditions which do not contribute to answering the research question. Part (B) question about biophilic design pattern, (C) culturally appropriate design. You may choose to skip any questions that you do not want to answer. Also, you may withdraw from the study at any time, whether during this interview or afterwards. I will keep all your information private and the information your share, which is called data, will only be used for the research study. Thank you again for agreeing to participate in this study, and as we proceed through the questions, please answer as honestly and fully as possible. There are no right or wrong answers to the questions I am asking, only your impression of your experience and preferences. Also, I

can reword or repeat questions if that is helpful to you. This interview will likely take about 2 hours, and we can pause at any time if you would like to take a break. At a certain point in the interview, we will walk through your home and I may ask you questions related to specific aspects of the house that are connected to biophilic interior design.

Do you have any questions for me?
[allow participant to ask any questions and provide responses]

Let's go ahead and begin:

Interview Question	
A) Demographic and Descriptive Questions	
1. Participant name: (confidentiality)	
2. Age:	
3. Gender:	
4. Where do you live? Apartment, Home, other.	
5. Do you have any health limitation(s) that require accommodation in the home, and which you are willing to disclose?	
6. What is your city of residence?	

7. List reasons for living in your home at this time (one or more).	
8a. Can you describe some activities that you like to do in your home?	
8b. How does your home environment support or inhibit these activities?	
9a. What do you appreciate/ value about living at home? Please explain.	
9b. Are there challenges? Please explain.	

Interview Question	
B) Biophilic Design	
11. Are there any colors you like to use in your home? Why do you prefer these colors?	
12. What sort of materials do you prefer to use for furnishing and/or design of your home?	
13. What do you think about using Local materials and products (from KSA)?	
14a. What natural features surround the outside of your home?	

15. Do you like to travel to a naturalistic region? Please explain why or why not.	
16. What is your opinion about animal motifs in the home?	
17. What is your opinion on having natural ventilation, shading devices, exposed walls, or other means of feeling the natural changes in air temperature and humidity in the home environment?	
18. Tell me what your feeling is toward natural aromas in your home? do you like to have aromas smells in your home?	
19. What your relationship with the pets? What do you think about getting animals within your compound or home environment?	
Interview Question	
20. Do you like natural sounds in your home? For example, sound of water, (fountains) sound of birds, the sound of wind and foliage?	
21. Do you like to have sunlight at your home this could be through big window or balcony? and why?	
22. Could you describe to me what is the place that you wish having on you home for practicing the meditation or relaxation?	
C) Islamic Home Design in KSA	
23.. Do you like your home to include any kind of Islamic motifs? Please explain why yes or no.	
24. Tell me how your home relates to your personality and culture?	

25. Tell me whether your home allows receiving guests of both sexes. Is your home suitable for receiving guests of both sexes?	
26. Do you enjoy hosting and socializing with family, friends, and other guests in your home? Please explain	
27. Where do you practice spirituality in your home?	

Scholarly Connections to Interview Questions

Question	Related to
7/ List reasons for living in your home all this time. (one or more)	Successful Aging In Place I: Choosing between staying at home or moving: A systematic review of factors influencing housing decisions among frail older adults - (Roy et al., 2018). https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5749707/ .
Q8/ Can you describe some activities that you like to do in your home?	Successful Aging in place I: (figure 1.1)
Q9/ How does your home environment support or inhibit these activities?	Related to: Successful Aging In Place I: (Szanton et al., 2014) Improving unsafe environments to support aging independence with limited resources
Q10/ What do you appreciate/value about living at home? Please explain.	Related to: Successful Aging In Place I: From theory to practice (Iecovich, 2014). Aging in Place: Growing Older at Home (Longo, 2011). Ensure that aging in place helps to achieve well-being.
PART II: BIOPHILIC DESIGN	

Q11: Are there any colors you like to use in your home? Why those colors?	Relates to: Biophilic Design Pattern II. Indirect Experience of Nature – Natural Colors (Kellert, S. and Calabrese, E. 2015. The Practice of Biophilic Design. www.biophilic-design.com)
Q12: What sort of materials do you prefer to use for furnishing and/or on the interior surfaces of your house?	Relates to: Biophilic design pattern II. Indirect Experience of Nature – Natural Materials (Kellert, S. and Calabrese, E. 2015. The Practice of Biophilic Design. www.biophilic-design.com); [P9] Materials Connection to Nature (2014 Terrapin Bright Green / 14 Patterns of Biophilic Design Terrapin
Q13 / What do you think about using Local materials and products (from KSA)?	Related to: Biophilic design pattern II: Experience of Space and Place (Kellert, S. and Calabrese, E. 2015. The Practice of Biophilic Design. www.biophilic-design.com) Place-Based Relationships—Culture Together With Ecology, Rooted in the Local Geography. (McGee & Marshall-Baker, 2015)
Q14/ What natural features surround the outside of your home?	Related to: Biophilic design pattern II: Direct Experience of Nature- Natural Landscapes and Ecosystems
Q16 / Do you like to travel to a naturalistic region? Please explain why yes or no. (vision - naturalistic) this question encouraging older adult to explain the negative or positive effect of natural factors.	Related to: Biophilic design pattern II: Direct Experience of Nature – Landscapes and ecosystems (Kellert, S. and Calabrese, E. 2015. The Practice of Biophilic Design. www.biophilic-design.com) .

Q17: What is your opinion about animal motifs home?	Related to: Biophilic design pattern II. Indirect Experience of Nature – Animals (Kellert, S. and Calabrese, E. 2015. The Practice of Biophilic Design. www.biophilic-design.com)
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Q18 / What is your opinion on having natural ventilation, shading devices, exposed walls, or other means of feeling the natural changes in air temperature and humidity from the environment?	Related to: Biophilic design pattern II. Thermal & Airflow Variability (<i>14 Patterns of Biophilic Design</i> , 2014).
Q 19/ Tell me what your feeling is toward natural aromas in your home? Having plants that small aromatic plants or natural plant oils. would you like to have these smells in your home?	Related to: Biophilic design pattern II - Non-Visual Connection with Nature (<i>14 Patterns of Biophilic Design</i> , 2014) .
Q20/ What your relationship with the pets? What do you think about getting animals within your compound or home environment?	Related to: Biophilic design pattern II. Non-Visual Connection with Nature (<i>14 Patterns of Biophilic Design</i> , 2014).

Q21/ Describe to me what mean to your natural sounds? For example, sound of water, (fountains) sound of birds, the sound of wind and foliage ?	Related to: Biophilic design pattern II. pattern biophilic Non-Visual Connection with Nature (<i>14 Patterns of Biophilic Design</i> , 2014).
Q22/ Do you like to have sunlight at your home this could be through big window or balcony? and why	Related to: Biophilic design pattern II. Direct Experience of Nature – Natural light (http://www.bullfrogfilms.com/guides/biodguide.pdf)
Q23/ Could you describe to me what is the place that you wish having on you home for practicing the meditation or relaxation?	Related to: Islamic Culture Design III :(figure 40) .
24/. Do you like your home include any kind of Islamic motifs? Please explain why yes or no.	Related to: Islamic Cultural Design III: Appropriate standards; characteristics of Islamic art .(“Max Condon,” n.d.) Max Condon: Key Characteristics of Islamic Art.
Q25 / Tell me how your home relates to your personality and culture	Related to: Islamic Culture Design III: (Bahammam, 1998) Factors Which Influence the Size of the Contemporary Dwelling: Riyadh, Saudi Arabia.

Q26/Tell me how much you can receive guests of both sexes in your home? is your home suitable for receive guests of both sexes?	Related to: Islamic Culture Design III: (Bahammam, 1998) Factors Which Influence the Size of the Contemporary Dwelling: Riyadh, Saudi Arabia
Q27 /Do you enjoy receiving and socializing with family, friends, and other guests in your home? Please explain	Related to: Islamic Culture Design III: Physical Space and Social Interaction (Brand, n.d.)
28 / where you practice spirituality in your home	Related to: Islamic Culture Design III + Successful aging in place I: (Figure 40)